The FOUNDRY

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Castings Bottle Beverages for Thirsty Multitudes

NOT so many years ago all of the soft drinks produced in the country were included under the general heading of *pop*, or *tonic*, consisting of approximately half a dozen flavors. Then some aggressive manufacturer conceived the idea of inventing a special drink to be sold under a trade name. Aided by consistent advertising campaigns, the idea proved successful, and today hundreds of different kinds of drinks are produced, to be consumed and enjoyed by millions of people. In recent years the manufacture of various kinds of soft drinks has changed from a haphazard procedure into an exact science, making possible the production of enormous quantities of beverages of uniform quality. Much of the success in this field of manufacture may be attributed to the utilization of numerous exceedingly interesting machines. Aided by washing and sterilizing machines, bottle testing equipment, syruping machines, fillers, crowning machines, labeling and foiling machines the manufacturer has succeeded in making practically all operations mechanical from the time the empty bottles are unloaded until the beverage has been prepared and bottled. The foundry industry plays an important part in the manufacture of soft drinks, since the machines are constructed mainly of castings.

Extensive Mechanical Equipment Enables one Company To Fill 250,000 Bottles Daily

Find Where Castings Can Be Sold.

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RADIATOR FOUNDRY

By Frank G. Steinebach

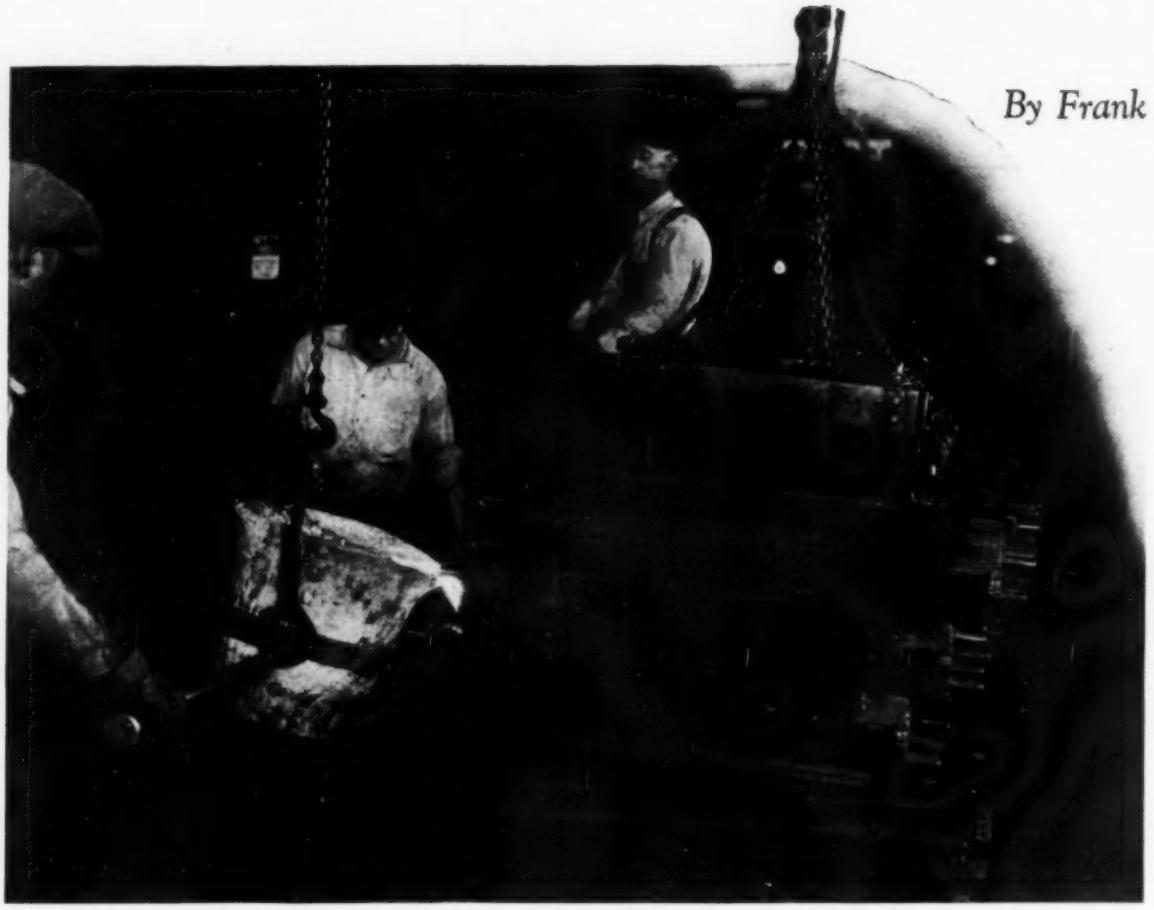


Fig. 1—A Rig for Weighting the Molds Speeds the Pouring Operation

THOUSANDS of years ago when man first acquired the outward appearance of civilization, he discovered accidentally that certain foods were made more palatable by the application of heat. Cooking first was accomplished over the open fire, but as the years passed, crude stoves were devised which helped greatly in cooking operations. Several hundred years after the appearance of the first so-called cooking stoves, man found that he could be more comfortable in the cold seasons if he heated his house with a fire.

At first the fire was placed in the center of the room and no provision was made to remove the smoke and gas. Consequently, this method of heating was not a great success, until sometime later when methods of ventilating the room and removing the smoke and gas were devised. The fire in the center of the room was followed by the fireplace, perhaps the oldest of modern heating methods. The fireplace was introduced during the Middle Ages and rapidly was adopted throughout the countries of northern Europe. The stove followed the fireplace and is said to have been used first around the close of the fifteenth century, although that type of heating unit did not come into general use until several centuries later. Benjamin Franklin was one of the first designers of heating stoves and furnaces.

Other methods of heating which are used extensively today also were employed in past centuries. While the Romans used hot water running through brass pipe to heat their bath rooms, that method of heating was lost with the fall of the empire and was not rediscovered until 1777 when it was used to heat hothouses in Paris. That method was introduced into England and later into Canada, but did not become popular in the United States until the close of the nineteenth century. Heating by steam was tried in England about the middle of the eighteenth century but was not used in the United States until a century later.

Progress in the design of heating units, such as stoves, furnaces and boilers for hot water or steam heating through radiators, has been linked closely with the foundry industry. As man tried various materials in the construction of stoves,

Requires Exacting SAND Control

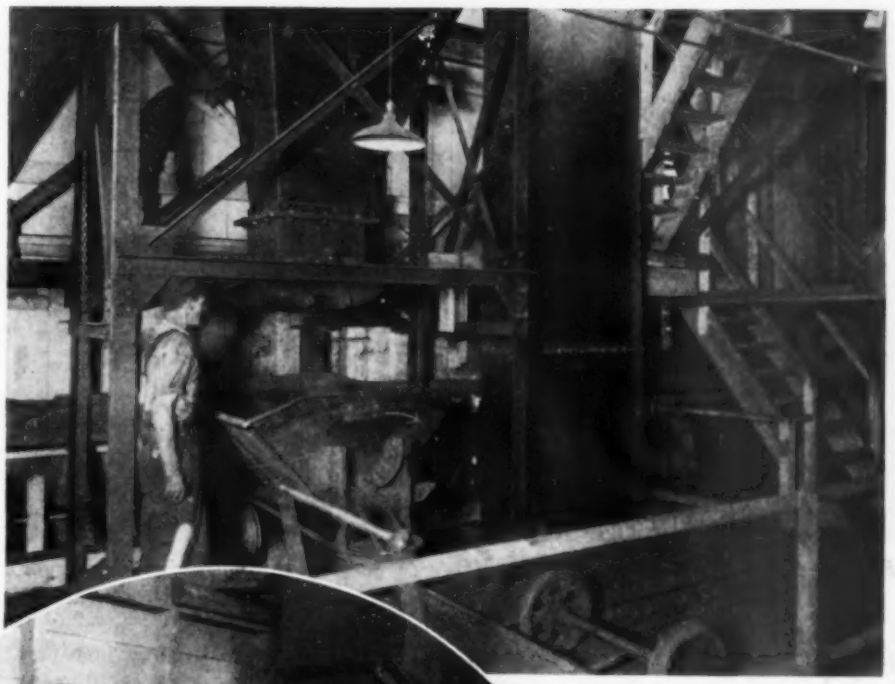
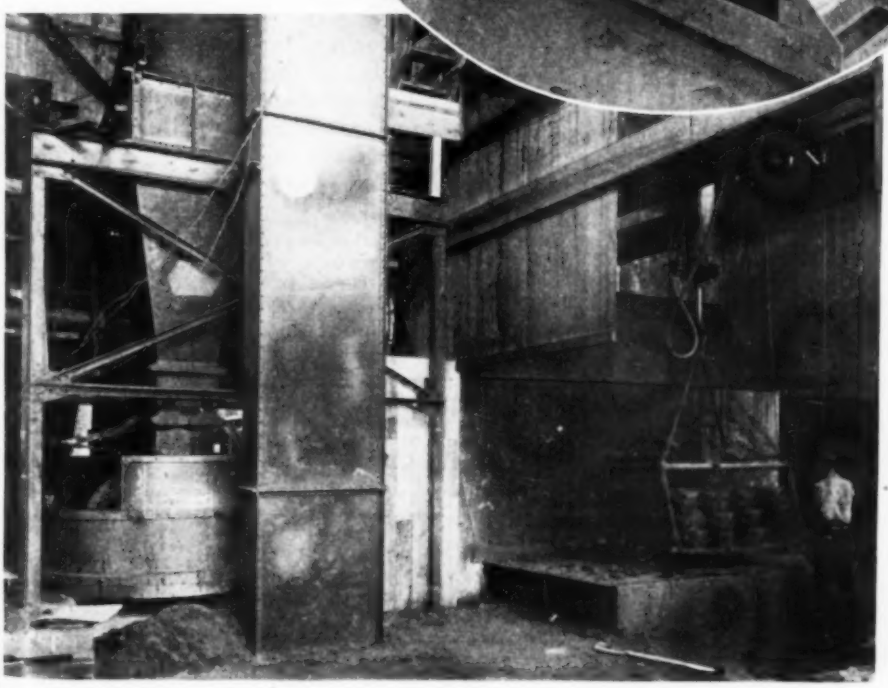


Fig. 2 (Below)—Shakeout, Elevator and Pan Type Mixer Used to Handle the Sand. Fig. 3 (Right)—A Device Consisting of Studded Cylinder and a Series of Brushes Aerates the Sand Fig. 4 (Upper Right)—Sand from the Aerator Falls Into a Steel Hopper. It Is Carried in a Dump Car From the Hopper to the Various Bins Located at the Molding Floors



he found that iron had many favorable characteristics and that the metal in the cast form withstood the destructive action of the fire. Today the major portion of all heating equipment is constructed of cast parts. Modern man finds little difficulty in securing a suitable medium for heating the home, the office or the plant, but finds it necessary to study his requirements to install the most efficient type of equipment. About 27 years ago James B. Clow & Sons, Chicago, introduced a heating unit which employs both steam and gas and finds numerous applications. It is used for heating large auditoriums, apartment buildings, stores, offices, and numerous other places where a central heating plant is not installed.

The outward appearance of the unit used in this heating system is similar to the radiators used with steam heating plants. The radiators are constructed of cast-iron sections

Fig. 5—Sand Is Carried From the Mixer to an Elevator on a Belt Conveyor

which are fitted together with cast malleable slip nipples and held in place firmly by steel tie rods. The upper part of the sections forms the radiating surface. Directly beneath that surface is the water chamber which holds a body of water 1-inch deep. The combustion chamber, located below the water chamber, is an integral part of the radiator sections and encloses the gas burner.

Regulation Is Automatic

Pressure of the steam in the radiator actuates an automatic regulator which controls the amount of gas necessary to maintain a constant steam pressure. A safety valve in the radiator prevents an excessive steam pressure which might result from a high gas pressure. Several types of the units manufactured by the company are provided with a special vent section in which the products of combustion are collected and exhausted through the special section and a flue or stack constructed of cast iron sections is set into the wall.

Radiators, burners, regulators, and flues are manufactured complete at the Newcomerstown, O., plant of James B. Clow & Sons. The special foundry in which the cast parts of the unit are made, contains a number of interesting features, including a special sand handling and preparing unit, special rigs for pouring and shaking out the castings, special molding equipment, etc., all of which will be described in detail.

The main portion of the foundry building is divided into three sections. The front portion of the building is considered the specialty foundry and is devoted to special castings of nonferrous and ferrous metals. The main section of the foundry is located in the center of the building and contains the sand preparing equipment, the molding floors, the pouring equipment and the shakeout station. The rear portion of the plant contains the equipment for making and baking cores. The cupolas are located in a room at one side of the plant while the cleaning department and the machines for reaming the radiator sections are at the opposite side of the main foundry building.

The foundryman casting radiator sections encounters numerous difficulties due to the character of the product. Beauty has become one of the selling points for radiators. To meet the popular demand, manufacturers now are producing radiators which are designed with pleasing and artistic lines, but this feature often adds to the difficulties encountered in casting the sections in the foundry. Accompanying the demand for beauty is the desire for a radiator with a smooth finish, and for that reason a fine molding sand must be used. The large amount of core work necessary in casting radiator sections naturally produces considerable gas and therefore the mold must be well vented. Experience has shown that absolute control of the sand is essential if smooth, sound castings are to be produced, and for that reason sand preparing equipment is an important factor in the radiator foundry.

Install Sand Preparing Unit

A short time ago a complete unit for handling and preparing sand was installed at the Newcomerstown plant by the Jeffrey Mfg. Co., Columbus, O. The various parts of the installation, which take the sand from the shakeout, pass it through a mixer and aerator and carry it to the distributing floor, are shown in several of the accompanying illustrations. The new equipment consists of a steel shakeout hopper, two belt conveyors, two bucket elevators and two 4-ton hoppers with clamshell valves, all supplied by the Jeffrey company. This equipment handles the sand to and from a special vibrating screen, a mixer made by the National Engineering Co., Chicago and an aerator man-

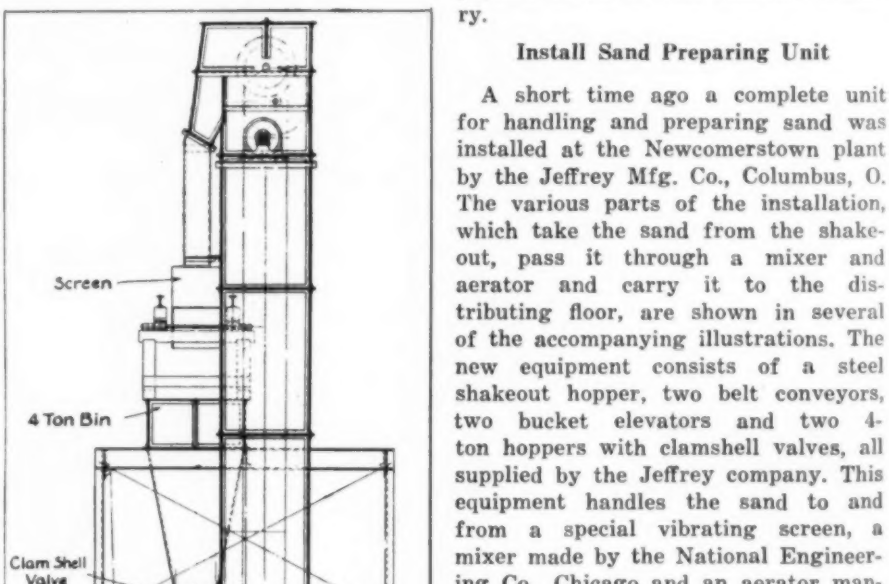


Fig. 6—Diagram Showing Relative Location of Shakeout Hopper, Elevator, Vibrator Screen and Mixing Machine

ufactured by the Jeffrey company and similar in design to that made by the Newaygo Engineering Co., Grand Rapids, Mich. The motors used in the installation were built by the General Electric Co., Schenectady, N. Y.

To secure a clear conception of the practice in the Clow plant, the sand will be followed from the shakeout through the various operations and to the molding floor. Sand falls from the flask into the steel shakeout hopper, which is 7 feet wide and 10 feet long and is shown in Figs. 2 and 10. The hopper is covered with a 2 x 10-inch, mesh bar, hinged grating which allows the sand to fall through, but retains the castings and the gates. The sand falls through the grating upon belt conveyor in the pit which carries it to the elevator, shown at the extreme left in Fig. 10 and in the center of Fig. 2. This bucket elevator carries the sand and discharges it on a vibrating screen. A portion of this screen may be noted at the top of Fig. 2 immediately to the left of the elevating shaft. This screen removes refuse and cores, which were not retained by the grating on the shakeout hopper, and allows the sand to fall through to the storage hopper immediately below. The refuse falls through a chute and into a wheelbarrow and later is wheeled to the dump.

Sand is mixed in the mixer shown in Fig. 2. It may be interesting to mention at this time that the photographs of the sand handling and preparing equipment, which are reproduced in the accompanying illustrations, were taken at the time the unit was placed in operation. Since that time a hood has been constructed over and around the sand muller, shown in Fig. 2, so that all of the steam formed when water is added to the hot sand, and also any dust, are carried away. This feature prevents a considerable amount of dust and steam from being dissipated in the foundry atmosphere. The illustrations showing the muller without the hood are used to show the arrangement of the pan and the hopper.

One Man Controls Mixture

Actual mixing and preparing of the sand is controlled by one man stationed on the platform shown at the left of the mixer in Fig. 2. When the muller is in operation and ready to receive a batch of sand, the operator opens the clamshell valves with a lever and allows the proper amount of sand to fall into the mixing pan. This mixer has a capacity of approximately 1 ton of sand per batch. Water then is added through a perforated pipe which is curved around a portion of the side of the mixing pan. The amount of water added is controlled by operating a valve which is located near the opening in the hood. The mill is filled in 10 seconds and discharged in 20 seconds. This allows 1½ minutes for mixing when running a full schedule of 30 tons per hour.

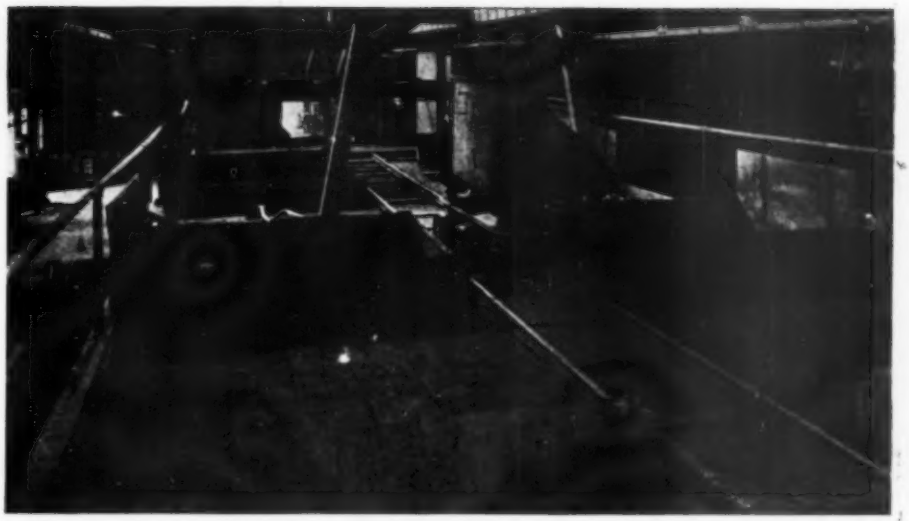


Fig. 7—Two Men Handle the Sand From the Preparing Equipment to the Molding Floor

The men in charge of the Newcomerstown plant believe that moisture content should be controlled most carefully in preparing sand for the radiator shop. Experience has shown that a moisture content ranging between 5 and 6 per cent produces the best results in that plant. While the company maintains a testing laboratory and tests a number of samples of sand each day, the results of these tests are not available for control of each individual batch of sand. However, each batch is tested by the operator, who uses the old and honored system of squeezing a handful of sand.

After a certain amount of water has been added to the sand, the operator secures a sample from the pan with a cup attached to a stick. He tests this sample and continues to make tests as the sand is mixing. If

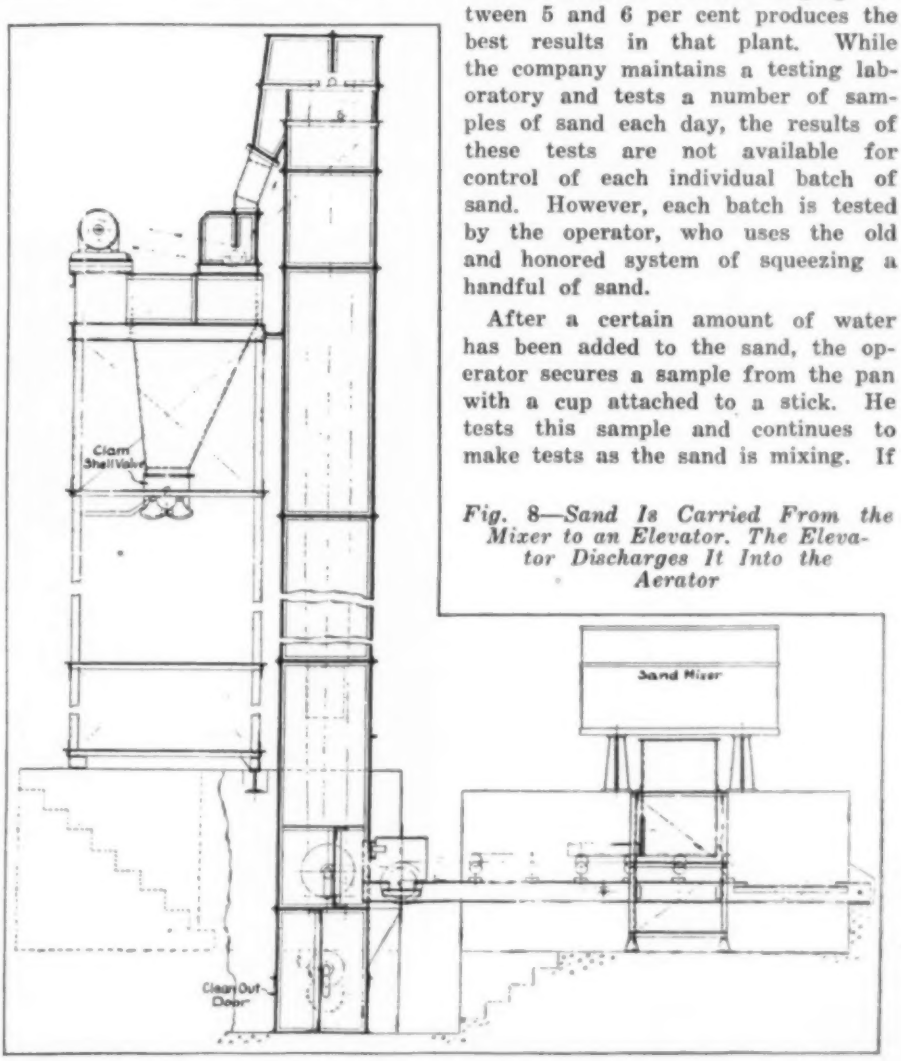


Fig. 8—Sand Is Carried From the Mixer to an Elevator. The Elevator Discharges It Into the Aerator

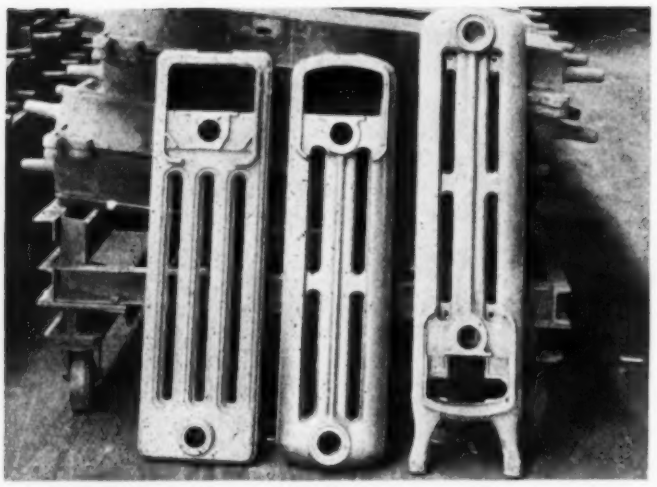


Fig. 9—The Section in the Center Was Poured in Sand Prepared by the New System

he considers the sand too dry, more water is added and if the sand contains too much moisture he adds more sand by opening the clamshell valve. When he considers the moisture content correct and the sand has been mixed a sufficient length of time, the batch is dumped upon a belt conveyor.

Results Are Consistent

Surprisingly consistent results have been obtained with this method of determining the moisture content of the sand. The tests made in the laboratory show that the moisture content seldom deviates from the limits desired. Several men in the plant are sufficiently skilled to secure accurate results so that no change in the quality of the sand would result from the absence of the regular operator.

When making the moisture test, the operator also determines approximately the bond strength of the molding sand and new sand is added as required. Once every week or ten days the strength of the sand is increased by the addition of a green bond. The time for adding the bond is determined by the daily strength tests which are made in the laboratory.

The belt conveyor, which receives the sand from the mixer, carries it to a bucket elevator, the end of the belt conveyor discharging into the bucket elevator being shown in Fig. 5. This illustration shows plainly the type of equipment used in the construction of the belt conveyors. The bucket elevator carries the sand up to a room at the top of the foundry, a distance of approximately 40 feet, and discharges it into a sand conditioner as may be noted in the diagram shown in Fig. 8. This conditioner or aerator consists of a revolving, studded roll running at approximately 900 revolutions per minute and operating against a series of adjustable wire brushes, as shown in Fig. 3. The combined action of the roll and wire brushes disintegrates and aerates the sand as it passes through the machine.

From the sand conditioner the sand drops into a hopper, a portion of which is shown in Fig. 4. This hopper is equipped with a clamshell valve, as may be noted in the illustration, for discharging the sand into a rocker dump car which operates on the mezzanine floor. The floor is built 10 feet above the main foundry floor. The dump car then is carried on the transfer car to either of the two tracks which run above the molding sand storage bins. The car is run along the track to the desired bin and the sand is dumped, as may be noted in Fig. 7. The general layout of the bins will be described later in connection with an explanation of the molding floor.

The Clow company has found the sand handling and preparing installation advantageous in a number of ways. Smoother castings have been made possible with the finely disintegrated sand prepared with the new equipment, as may be noted in Fig. 9. In that illustration the radiator section made with sand prepared on the new equipment is shown in the center, while the sections on the sides were poured in sand prepared by methods formerly used. The company has found it possible to secure a more uniform temper and at the same time greater strength, thus decreasing losses due to blowholes and scabs. The uniform condition of the sand also reduces the responsibility placed on the molder, since he has little difficulty in ramming the sand the correct amount with uniform sand. Laboratory tests show a moisture variation in the sand of only 1 per cent. The sand, as previously prepared, averaged 100 vent, as shown by the American Foundrymen's association tests while the sand prepared by the new equipment, due to its greater fineness, averages 50 vent. The green strength shown under present methods of preparation is 150 American Foundrymen's association test as compared with 100 American Foundry-

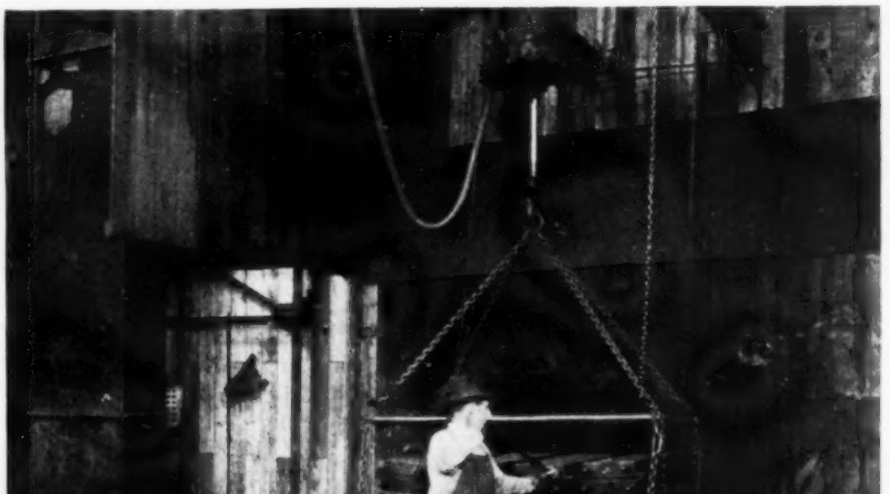


Fig. 10—A Special Rig With Pneumatic Hoist Handles Molds at the Shakeout

men's association for the old method of sand preparation.

Only four men are required to run the system. One is stationed at the mixer, two on the mezzanine floor to distribute the sand and one on the main foundry floor to collect gangway sand from the foundry floor and wheel it in a wheelbarrow to the shakeout hopper where it is returned to the sand preparing system. This man also distributes the facing sand to the molding stations. The cost of additional equipment and men to prepare the facing sand also has been eliminated since it is prepared with the new unit. Facing sand is run through the system late in the afternoon and the first thing in the morning and is stored in two of the bins over the molding floor. However, the company expects to build special bins for the facing sand in the near future.

The foundry is arranged with 15 molding stations similar to those shown in Fig. 11. Five stations are located along one side of the building and ten in about the center of the room. A view of a portion of the molding floor arranged in the center of the building is shown above.

As may be noted in Fig. 11 the sand storage bins divide the molding floor into sections and four molders work between two bins. Two molders working at one bin make copes and the two working at the other bin make the drags. Each molder works with the molder immediately behind him in completing the mold. The bins along the side of the building, which are one-half the capacity of the larger bins, also divide the floor into five sections but only two molders work between two bins. The bins are wood and have a chute at the bottom which may be opened or closed by the molder to regulate or control the passage of the sand.

Patterns for the radiator sections are mounted on heavy cast plates and these plates in turn are supported by short legs made of angle iron. The plate has two projecting pins, one on either end and at opposite sides, while holes are provided opposite the pins. The flask also has two projecting pins which fit into the holes on the base plate and two holes which receive the pins on the plate. This system of staggering the pins makes it necessary for the molder to place the flask on the plate in the same position each time. This is important, since the flask has a special pocket cast at one end which hangs over the mold below when the molds are stacked for pouring, thus preventing sand from overhanging.

The molder first places the flask in position and sets the chaplets in the holes provided in the metal pattern. He riddles some facing sand and fills the flask about half full of backing sand. He then rams the sand around the flask, using the handle of the shovel as a peen. The remainder of the flask then is filled with sand by lowering the chute on the side of the bin and the molder rams the mold by tramping with his feet. He then completes ramming the mold with a butter and strikes off the sand. The cope and the drag are made in practically the same way, with the exception that two vent rods are used in the cope. These rods pass through holes in the flask and extend to the heavier core sections in the center of the flask. The rods are pulled just before the cope is removed from the pattern plate.

The mold is stripped from the pattern by the operator who throws a lever which actuates four pins, one at each corner of the pattern plate. These pins move upward when the lever is thrown and lift the cope or drag mold away from the pattern and plate. The two molders then take the drag mold from the machine

Fig. 11—Wooden Bins Are Constructed Over the Molding Floor. The Finished Molds Are Placed on Special Racks to be Transported to the Pouring Station

and place it on a rack similar to that shown in Figs. 10 and 11. This rack consists of an angle iron frame supported by four casters. The frame has a vertical extension built along one side, as may be noted clearly in Fig. 10, upon which one end of the bottom board rests. This extension along one side permits the molds to rest on the rack in a slanting position, the gate being at the high end of the mold. The molds remain on this rack from the time they are made until they reach the shakeout hopper.

Cores Are Important

After the drag has been placed on the rack, the cores are set. In the type of radiator made by the Clow company, two cores usually are used, one for the radiating section and one for the gas chamber. An idea of the type of cores used may be gained from the illustrations of the radiator sections shown in Fig. 9. The cope then is placed on the drag, another flask secured from a truck of empty flasks near the molding station, and operations necessary to make the mold are repeated.

Considerable care must be exercised in making cores for radiator sections. The core used in the upper or radiation section must be strong, to withstand handling and the pressure of the metal. At the same time the core must disintegrate readily after the casting has been poured, to permit all of the sand to escape from the radiator section during the cleaning process. Cores also must maintain the proper shape and size within fairly close limits, since only a slight variation in the shape of the core will result in uneven thickness of section and a scrap casting.

Cores for radiator sections and other castings made in the Newcomerstown plant are produced in a special department located at one end of the building. Sand is mixed in a small muller type mixer made by the National Engineering Co., Chicago, and is carried to the coremaking stations in wheelbarrows. The coremaker's bench consists of a long box in which the sand is kept. Four men work at one box, which is supported at a convenient height for the coremaker. At a convenient distance from the ends of the box, two rods are placed crosswise and flush with the top of the sides of the box. The two rods are about 1-foot apart and support the coreboxes during the coremaking operations.

All radiator section cores are placed in the oven in dryer boxes. In making the core for the radiation section of the radiator loop, such as in shown in the foreground of Fig. 11, the dryer is used as the corebox for making the half of the core which sets in the cope half of the mold. Since that half of the core is supplied with small metal plates upon which the points of the chaplets rest, the plates are placed in the dryer and baked into the core. One man places the plates in the dryer core boxes for two molding stations. One operator then places the dryer corebox on the two rods, fills it with sand, rams it the necessary amount and strikes it off. Vent holes are made lengthwise through the center of the core with a plate which is placed over the half of the core and pressed down. This plate has small strips of metal attached to the bottom which produce a vent hole in the core. The coremaker then slides the dryer core box with the completed half of the core to the coremaker on the opposite side of the table.

Two Men Make Core

In the meantime the second coremaker has been making the half of the core which rests in the drag half of the mold. Since the metal in the mold exerts an upward pressure on the core, the metal plates, previously mentioned, are not necessary. The half of the core is made in a special metal corebox and is vented in the same manner as the cope half, which has been described. By the aid of special guides, the two coreboxes are brought together in such a manner that the two halves of the core match exactly. With the dryer half on the bottom, the corebox is lifted off and the dryer with the core is placed on the rack type core car and later is run into the oven. Cores for the burners, the burner compartment in the radiator section and other cores used in the shop are prepared in a similar manner.

The coreroom has a battery of three car-type ovens along one side and four ovens along the opposite side. These ovens were manufactured by the W. W. Sly Mfg. Co., Cleveland. A transfer track is built along the front of the battery of three ovens and another transfer track is built along the battery of four ovens and also extends along the remainder of the coreroom. Four tracks connect the two transfer tracks, all of the tracks being 36-inch gage. A spur from the Pennsylvania railroad passes along the side of the coreroom so that core sand may be unloaded directly from the railroad cars into the sand storage bins.

Cores are transported from the core department to the molding floor by trucks and are stacked at the molding stations, as may be noted in Fig. 11. In placing the cores in the mold, the molder must check carefully the points where the small chaplet plates are located and if any are missing in the core, new plates must be supplied. This feature is important since the loss of one of the metal supports for the chaplets may result in a scrap casting.

Completed molds are stacked on the racks either two or three high, depending of course on the size of the flasks which range from 26 to 45 inches. As soon as the rack has been loaded, an electric lift truck picks up the rack and molds and carries them to the pouring station which is located at the opposite end of the main bay. Two electric lift trucks handle all of the molds from the molding floor to the pouring station, care for the necessary handling at the shakeout and return the racks and the empty flasks to the molding stations. One electric truck always is held as a spare.

Metal is melted in one of two cupolas located in a special building. The pouring spouts extend into the main foundry bay. A monorail track loops in front of the cupolas and then runs along the section of the foundry bay devoted to pouring. The monorail also extends into the special foundry at the front end of the plant so that iron may be carried to that department when necessary.

Pouring Rig Interesting

Equipment used in pouring is shown clearly in Fig. 1. The ladle is supported by a block hoist attached to the trolleys which travel over the monorail. The hoists and monorail were manufactured by the Louden Machinery Co., Fairfield, Ia. As may be noted in the illustration, three men constitute the pouring crew. After the rack loaded with molds has been placed in position along the monorail line, a ladle of metal is brought from the cupola and the bottom row of molds is poured. The ladle then is raised by one of the pouring crew operating the block, and the next row of molds poured. When the molds are stacked three high as shown in Fig. 1, the ladle again is raised and the top row of molds poured.

A rather ingenious rig has been developed to weight the molds while pouring. This equipment was designed with the idea of weighting the molds sufficiently to prevent the force of the metal in the mold from lifting the cope. At the

(*Concluded on Page* 931)

Makes High Test Cast Iron

Castings with Varying Section Require a Close-Grained, High Strength, Wear-Resisting Iron Which Is Obtained by Nickel Additions—Gives Results and Data on the Method Followed

By M. E. Greenhow

IN 1923, considerable difficulty was encountered in obtaining in certain types of castings, varying in section from ¼ to 1 inch, a close-grained, high-strength, wear-resisting cast iron, free from internal shrinkage. The silicon required to keep the thin section from chilling gave an undesirable structure, so considerable experimental work was carried on with various alloy additions until an iron with the desired physical properties was developed. The following is a brief summary of the physical characteristics and melting operation used.

The best results are obtained when the total carbon is between 2.75 and 3.00 per cent. It is not difficult to obtain this range of carbon with a large percentage of steel scrap, well balanced cupola construction, and efficient and uniform cupola operation. The manganese content should be from 0.75 to 0.90 per cent, its chief function being to eliminate oxides in the molten metal. The manganese lost in melting seems to be somewhat higher than in ordinary cast iron mixtures, which the author has found to be consistently 18 to 20 per cent of the total amount charged, while in the high-strength cast iron practice the percentage of manganese lost is from 25 to 29 per cent.

Decomposes Carbon

A fairly wide range of silicon content is permissible in this iron without any appreciable effect upon the strength, the most uniform results being obtained with a silicon content of 1.25 to 1.65 per cent. The author's experience is that a silicon content lower or higher than mentioned above gives lower physical characteristics. It must be borne in mind that this range of silicon applies to a particular type of casting. The primary effect of the silicon is to decompose the combined carbon into graphite and ferrite ($Fe_3C = 3\ Fe + C$). Silicon is a vigorous graphitizer, and causes carbon to be precipitated during cooling through the critical range, being vigorous at high temperatures and decreasing as the temperature falls. Silicon promotes internal shrinkage and is a powerful deoxidizer. Its undesirable property of promoting internal shrinkage is detrimental to producing uniform results.

Substitution of a certain percentage of nickel to replace a part of the silicon greatly reduces internal shrinkage and is conducive of results which are uniform. The use of nickel in reducing shrinkage is reflected in the pattern shrinkage. The untreated iron shows a shrinkage of ¼-inch per foot, but the same iron when nickel treated shows a shrinkage of only 3/16-inch per foot.

Nickel has the graphitizing property but to a less degree than silicon, its graphitizing influence being mild when the iron reaches the upper critical range. It has an additional and valuable property of forming a solid solution with the ferrite, toughening the matrix with corresponding higher strengths.

Is Metallurgist

M E. GREENHOW, author of this article which was presented at the annual meeting of the American Society of Testing Materials held at French Lick, Ind., in June is metallurgist for the Nordberg Mfg. Co., Milwaukee.

In plain iron, the graphite is in the form of long flakes, their size depending upon the rate of cooling. Graphite in nickel-treated iron is fine, uniformly distributed through the matrix and is of a rounded or nodular shape rather than in long sharp flakes. This produces additional strength, as the continuity of the matrix is not broken up to the same degree as in plain iron.

The percentage substitution of nickel for silicon in the particular type of castings with which the author has been working ranges from 1½ times the silicon deduction in heavy castings to 2½ times the deduction in the lighter castings. For example, a certain casting which formerly required 1.25 per cent of silicon was reduced to 0.75 per cent silicon and 0.75 per cent nickel substituted.

The tensile strength of this material ranges from 55,000 to 60,000 pounds per square inch and can be obtained uniformly. The tensile strength is dependent upon the silicon, carbon and nickel content. Silicon and carbon substantially affect the results obtainable; as the percentage of either silicon or carbon is increased, the tensile strength is progressively reduced.

The brinell hardness on this material usually will be above 200. Although an iron that has been nickel-treated will show a higher brinell hardness than the same iron not nickel-treated, the nickel-treated iron will machine freely, while iron that has not been nickel-treated, of the same or even lower brinell hardness, will be practically nonmachinable. The chemical composition and physical properties of several heats taken at random from the files are shown in Table I.

Ratio Is Uniform

Transverse breaking load on a standard American Society for Testing Materials arbitration bar will vary from 5400 and 6000 pounds. Results as high as 6400 pounds have been obtained. The ratio of transverse strength to tensile strength on this material is consistently 1 to 10, that is, the tensile strength is close to ten times the transverse breaking load.

Machineability of nickel-treated irons according to test on one type of casting of intricate design and various metal sections was 33 per cent better than on the same iron untreated. Another type of castings had sections so light that as cast with the usual mixture they always required grinding, as tool repair and breakage of castings made machining prohibitive. Two hundred of this type of casting were treated with nickel with the result that 199 were readily machined, only one breaking in the milling operation. An average of all castings on which machining operation data were taken by the author indicated 22 per cent better machining time. A check was made on the dressing of tools on one job and showed that only one-half the cutter grinding was necessary.

A comparison of the physical prop-

erties together with chemical analysis of an iron treated with nickel and without nickel treatment is shown in Table II.

The melting process is of prime importance, the most important factor being temperature, as low total carbon of the charge corresponds to a higher melting temperature consequently higher melting temperatures than those ordinarily used will be necessary for best results.

The most desirable stock charged for high steel mixtures to produce the most uniform results are coil springs, or coil springs and short rail ends.

Experience and practice have proved that smaller charges than ordinarily used are conducive to better results and the following data has been compiled:

Cupola Diameter, in.	Weight of Charge, lb.
36	1000
48	2000
66	3000

To insure sufficient heat of combustion to produce the high temperature necessary, the fuel ratio, that is the ratio of coke to metal charges, should not be greater than 1 to 6½ or 7. Since the total carbon content depends largely on the melting rate, air volume and temperature, slightly higher blast pressures and consequently greater air volume must pass through the shaft of the cupola to stimulate faster melting. Recommended pressures and volumes follow:

Cupola Diameter, in.	Blast, oz.	Pressure, Inches of Water
24	3.92	7
36	7.85	14
48	8.96	16
60	10.08	18
72	10.64	19

The coke bed is also of vital importance and the following practice has proved to give good results. The initial coke bed of 40 to 50 inches above tuyeres is charged, ignited and burned to incandescence throughout, then about 6 inches more coke is charged and metal and coke charged successively until 8 to 10 tons have been charged, depending upon the size of the cupola. The stock is allowed to soak for at least one hour, preferably two. This soaking period heats the cupola and stock thoroughly and aids in increasing the melting rate of the first charge, also assuring good hot iron on the first tap.

In making ladle additions it is desirable to preheat all alloy additions because of their high melting temperatures.

The following metal charge has been found to give uniform results:

Metal charge in 36-in. cupola.—
1000 lb. of coil springs
15 lb. of 50-per cent ferrosilicon
Ladle additions (per 100-lb. metal).—
12 oz. of 70-per cent ferromanganese
8 oz. of 50-per cent ferrosilicon
24 oz. of ferronickel shot.

The alloy addition is certainly beneficial if applied to a given class of work, taking into consideration properly coke bed, coke melt, air volume and the proper balance between total carbon, manganese, nickel, silicon and phosphorus. On the other hand, it may be stated that indiscriminate use of nickel or other alloys in the cast iron or semi-steel field is detrimental rather than beneficial.

TABLE II

Comparative Tests

	Untreated	Treated
Total Carbon, per cent	2.64	2.44
Manganese, per cent	0.24	0.739
Phosphorus, per cent	0.024	0.066
Silicon, per cent	1.120	1.24
Nickel, per cent	none	2.04
Tensile Strength, lb. per sq. in.	41180	61820
Brinell Hardness	302	163

TABLE I

Chemical and Physical Properties

	Heat No. 1	Heat No. 2	Heat No. 3	Heat No. 4	Heat No. 5	Heat No. 6
Silicon, per cent	1.65	1.64	1.58	1.41	1.68	1.66
Sulphur, per cent	0.073	0.077	0.090	0.096	0.073	0.074
Phosphorus, per cent	0.11	0.13	0.097	0.13	0.11	0.16
Manganese, per cent	0.91	0.95	0.77	0.88	1.13	1.17
Total Carbon	3.02	3.07	2.89	2.86	2.73	2.98
Nickel, per cent	0.75	1.03	1.21	0.97	0.98	1.02
Transverse strength, lb. per sq. in	5100	5060	5390	5210	4900	5270
Deflection, inches	0.21	0.19	0.187	0.24	0.17	0.24
Brinell Hardness	228	217	228	217	228	217
Tensile Strength, lb. per sq. in.	49080	51000	50790	52600	48465	50030

Molten Iron Cools Off Rapidly in Ladle

Question: We melt 7000-pound charges of iron with 800 pounds of coke in our cupola to pour a rather light class of castings. Recently we have noted that the iron comes hot enough from the spout, but seems to lose its heat rapidly and is quite dull by the time the ladle is half emptied. We use a mixture of domestic pig, German pig, our own scrap and some scrap bought on the outside. Analysis of iron in the castings approximates: Silicon 1.95 per cent, manganese 0.50 per cent, phosphorus 0.50 per cent, sulphur 0.10 per cent.

Answer: Nearly every foundry has experienced this phenomena at one time or another in its career. The trouble has been overcome in all cases by changing the mixture, by omitting the particular element responsible for reducing the fluidity of the iron in the ladle. While foundrymen as a rule are familiar with the fact that the analysis of iron is not an infallible guide to its *running* qualities, still no one seems to know just why one iron of a given analysis will run thin castings readily, while a second iron of practically identical analysis will die on the way. One theory is that the unsatisfactory iron is made too rapidly in the blast furnace and that it lacks many of the desirable physical characteristics acquired by a slower melting time where the refining process is carried to a proper stage. In proof of this theory the wonderful properties of the old time cold blast charcoal iron, whether in molten or solid state, are held up for example. White iron, burned iron or any kind of scrap that has been remelted frequently has a tendency to reduce fluidity in any mixture in which it is used. In common foundry parlance, "It has all the life burned out of it." A discussion of the many involved chemical angles bearing on your inquiry would take up too much space. We are forwarding a marked catalog of books bearing on the subject which may be ordered through THE FOUNDRY.

Elect New Officers

Bucyrus-Erie Co., has elected W. W. Coleman, president; E. J. Swigert, senior vice president; G. A. Morrison, vice president and treasurer, and J. G. Miller, secretary. Mr. Coleman also has been made chairman of the board. The Bucyrus Co., South Milwaukee, Wis., and the Erie Steam Shovel Co., Erie, Pa., will continue to operate independently until Jan. 1, 1928, after which time the assets of both companies will be taken over by the Bucyrus-Erie Co. and the merger will become effective. The new company will operate as one unit with offices at South Milwaukee and Erie. There will be one consolidated sales organization with manufacturing plants at South Milwaukee, Erie and Evansville, Ind.

Specifications Alone May Exclude Good Core Oils

By H. P. Evans

ONE of the most interesting and most widely discussed papers presented at the meeting of the American Foundrymen's Association held at Chicago in June, 1927, was that of V. A. Crosby, Studebaker Corp., South Bend, Ind., relative to the purchase of core oils subject to specifications. An abstract of this paper appeared in THE FOUNDRY, Sept. 1, 1927. This specification, as adopted by the Studebaker Corp. specified the requirements of chemical and physical properties as shown in the fist line of Table I.

Specific gravity was included, as stated by Mr. Crosby, in an attempt to hold down the rosin content. Flash point and flame were specified to obtain a kerosene mineral oil or light furnace oil. The iodine number was specified as a measure of the strength that would be developed in a core. The saponification number was specified as a measure of the amount of animal or vegtable oil, or both, present. A satisfactory color would indicate a clear linseed oil and *H*-grade rosin. Most satisfactory results were obtained with an acid number within the range indicated. No tensile tests were run because of the opinion that the many errors encountered in this test make the results inconclusive.

Opinions Differ

During the discussion that followed the presentation of the paper one group aligned itself with Mr. Crosby as favorable to the selection of a core oil by a specification of chemical and physical properties even to the extent of making no tensile tests. The second group regarded the tensile strength of a standard briquet obtained by using a fixed amount of core oil with a standard sand under standard conditions as the most conclusive test.

In our laboratory a decision was made to run a complete investigation of a selected group of reputable core oils which would include all the physical and chemical properties proposed by the Studebaker Corp., and in addition the tensile strength developed in the cores. This investigation was undertaken with the idea of ultimately recommending one or two of the oils giving the most favorable results for use in our foundry, and incidentally of determining the best methods of procedure for testing core oils and making specifications for purchase.

H. P. EVANS, author of this article, received degrees of bachelor of science and master of science in chemistry and metallurgy from the University of Kansas, Lawrence, Kans., and a degree of doctor of philosophy from the Iowa State college, Ames, Iowa, in 1925. Dr. Evans has served as metallurgist for the American Smelting & Refining Co. as professor of chemistry and metallurgy at Kansas State Teachers college and Iowa State college and at the present time is metallurgist for the Pettibone Mulliken Co., Chicago. He also has contributed several articles to the technical press on research in ferrous metallurgy and allied subjects.

In the determination of tensile strengths the following procedure was adopted as standard and followed throughout the investigation. The sand used was screened through a 40-mesh screen and retained on an 80-mesh screen. The mixture consisted of 1 part by weight of oil to 60 parts of sand, the whole containing 7½ per cent moisture. All briquets were mixed and hand-rammed by the same operator under as nearly identical conditions as possible. The briquets were baked in the same relative position in the same oven at identical temperatures. Temperature control was obtained by a base metal couple, registering pyrometer. Fracture tests were made in an automatic briquet testing machine, manufactured by the Riehle Testing Machine Co., Philadelphia.

The tensile strengths given in the last column of Table I are the average values obtained in each case from at least 8 briquets made from a 1-60 sand-oil mixture containing 7½ per cent moisture and baked for 2 hours at 450 degrees Fahr. This temperature was intentionally chosen as somewhat above the average temperature prevailing in our core practice. This temperature ranges from 350 to 400 degrees Fahr. in our small cores to 500 degrees Fahr. a maximum temperature reached at times in our large cores. It was found that tensile strengths could be duplicated within 5 to 10 pounds.

Carry on Investigations

Because of the superior results obtained with oil *I* and *J* these two were selected for further investigation. Table II shows the results of a series of tests of tensile strengths at different core oven temperatures obtained in an effort to determine the temperature range of effective bond strength. The results of the test show core oil *J* somewhat superior to oil *I* at all temperatures investigated. The results also emphasize the fact that, insofar, as the capacity of the core ovens and other economies of core-room practice will allow the cores should be baked at the lower temperatures.

The core oil specified by the Studebaker Corp. is a light oil with a low rosin and high linseed oil content, and is quite expensive. Of all the oils in-

vestigated core oil *I* as shown in Table I approaches nearest the Studebaker specification. It is the lightest oil investigated, as shown by the low specific gravity, flash point and fire point. It has the highest iodine number and saponification number and a satisfactory acid number, color and odor. It develops a tensile strength of 137 pounds.

Oil *J*, on the other hand, is the heaviest oil investigated. It has an iodine number and saponification number slightly below core oil *I*, has an extremely high acid number and a slight fishy odor. Notwithstanding this extreme variation from oil *I* and the Studebaker specification, it develops a tensile strength of 150 pounds. These two oils then were used in actual foundry practice and both showed excellent results with oil *J* again the superior. Oil consumption was cut from 7 quarts to 6 quarts with no loss in core strength. The slight fishy odor was barely noticeable in the sand and was not objectionable. Little smoke occurred in the molds while pouring metal and the smoke given off was not irritating to the eyes as is the case with some oils.

Draws Conclusions

There is little doubt that a core oil meeting the Studebaker specification will yield excellent results in the core room. A specification is the safest measuring stick for guaranteeing reproducible shipments of core oil. However, any specification including chemical and physical and properties of the oil only, may be *beat* by a core oil manufacturer, or on the other hand may exclude a superior oil which will not fulfill all the requirements of the specification and yet, because of superior blending or for some other reason will yield a higher tensile strength and give superior results in the core room.

It is the opinion of the author that the tensile strength is the safest and most indicative single test that can be applied in seeking a satisfactory source of core oil supply. Notwithstanding the difficulty of determining a satisfactory standard for tensile strength determinations such as a given moisture content, oil-sand ratio, a standard sand supply available to all foundrymen, temperature of oven, time of bake, etc. this standard should be developed and accepted generally in foundry circles. Even without an accepted standard, comparative tests can be run which will give reproducible results, and will determine the comparative strength of cores from different oils. Establishment of one or more satisfactory sources of supply and continued acceptible tensile strengths obtained in the laboratory with continued success in the core room should establish the fact that the source of supply is holding up to its original standard.

Table II

Comparative Tests of Two Oils

Duration of bake	Temperature, Deg. Fahr.	Oil I—Lbs. per sq. in.	Oil J—Lbs. per sq. in.
2 hours	350	239	253
2 hours	400	144	181
2 hours	450	133	154
2 hours	450	119	148

Purchases Company

Columbia Radiator Co., McKeesport, Pa., has acquired all assets and equipment of the Ironton-Bernhard Boiler Co., Ironton, O., manufacturer of boilers. The boilers manufactured by the latter will be carried in conjunction with the firm's line of boilers and radiators. J. B. Bernhard will be associated with the Columbia company in a sales capacity.

Shrinkage Spots

Question—We are making 14-inch plow shares, chilled on the blade and point, and get a long, narrow depression about 4 inches from each end and on the edge of the blade, which appears to be a shrink. The body of the share is $\frac{3}{16}$-inch thick on the edge and tapers to $\frac{1}{8}$-inch at the edge of the blade. The charge consists of 500 pounds of pig iron, 350 pounds scrap from the mixture, and 150 pounds steel scrap.

Answer—The trouble with your casting is that it sets too quickly, not giving the iron a chance to feed into the portion which shrinks. An iron with a little more life would supply metal to this section and thus prevent shrinkage. If you are pouring your iron cold, it would set quickly, therefore you should see that the iron comes hot from the cupola and is poured promptly.

Oxidized iron, even though it does come hot from the cupola, would set quickly in the mold and cause shrinkage trouble. It is just possible that the steel clippings you are adding to your charge either are oxidized heavily by rusting before they go into the cupola, or are of such fine section that they are oxidized in the cupola. In charging steel you should have plenty of coke between the charges and use a fairly low blast pressure. The steel itself should not be in too light sections, as it may oxidize.

Table I

Test Data Obtained from Various Core Oils

Oil	Sp. Gr. 60 deg. Fahr.	Flash point, deg. Fahr.	Fire point, deg. Fahr.	Iodine number	Sapon. number	Acid number	Color	Odor	Tensile strength lbs. per sq. inch
Studebaker specfication	0.931 Max.	165-195	180-210	155 Min.	148 Min.	34-41	Clear amber	Not fishy	None
A	0.937	218	396	128.9	140.3	49.0	Clear amber	Not fishy	90.0
B	0.934	228	370	133.9	141.4	38.5	Clear amber	Fishy	92.0
C	0.928	229	410	134.0	142.0	40.0	Clear amber	Fishy	95.0
D	0.948	228	358	130.0	133.6	61.6	Clear amber	Not fishy	115.0
E	0.922	216	410	130.0	132.5	34.5	Clear amber	Not fishy	117.0
F	0.934	208	362	131.0	146.0	43.5	Clear amber	Not fishy	127.0
G	0.942	200	455	129.5	130.0	36.1	Clear amber	Not fishy	127.5
H	0.936	230	448	136.5	146.0	29.3	Clear amber	Not fishy	137.5
I	0.926	195	330	139.0	152.6	37.7	Clear amber	Not fishy	137.0
J	0.954	240	479	138.9	146.0	51.3	Clear amber	Slightly fishy	150.0

How and Why in Brass Founding

By Charles Vickers

Melts Bronze on a Forge

We want to make our own brass castings, consisting largely of rods of various sizes. Borings and scrap brasses, will be melted in one of our forges, using a small crucible. Is this method practical?

It is practical to do the work as outlined, although it will not be as convenient to melt on a blacksmith's forge as in a small brass melting furnace. We suggest such a furnace be rigged up, or purchased. The forge will have to be built up every time brass is melted, and, to be of service as a forge afterward, it will have to be dismantled. To fit the forge for the work of melting it will be necessary to take firebrick and build up a well over the blast aperture. The well must be considerably deeper than the crucible it is to contain, since there must be a bottom of hot coals under the crucible about 4 inches deep. In the course of the melting the coals must be kept at that depth, by raising the pot from time to time, so that coke will fall under it. Otherwise, the blast will chill the pot bottom, and the metal will not get hot enough to pour.

The well also must be a few inches higher than the top of the crucible. The wall must be built solidly or it will be ruined when the pot is pulled up. It would be advisable to construct a sheet iron cylinder of proper diameter with brick-retaining flanges at top and bottom. This cylinder can be lined permanently. Allow 3 inches of space between the furnace walls and the sides of crucible for the coke. Make a cover for the cylinder with a hole in the center through which the products of combustion can escape. This will be an improvement over the unsupported circular brick enclosure for the crucible. The writer has melted bronze and made driving brasses for locomotives on such an improvised furnace.

It will be necessary to have some person with a knowledge of molding to make the molds for the castings. Molding sand, a couple of flasks with bottom and top boards also will be necessary. It will be necessary to have proper crucible tongs to get the crucibles out of the furnace and they should be fitted with an eye bolt at the hinge to enable a bar to be passed through so the crucible can be held and manipulated while its contents are emptied into the molds. In the absence of skilled workers it is possible that a little experimental work will be necessary to get things running smoothly, as the proper dampness of the sand, and of the degree of hardness to which it is rammed must be known. During the progress of this experimental work it would be advisable to proceed leisurely in pouring a mold, so there will be opportunities for the workers to get away should anything go wrong.

Bearings Are Porous

We desire to learn if you consider an alloy of copper, 79.50 per cent; tin, 10.00 per cent; lead, 10.00 per cent nickel, 0.50 per cent a good mixture for bearing metal? How should it be melted and poured in order to overcome the porousness of the metal when cast in green sand molds?

This alloy is the familiar 80-10-10. It has a good reputation as a bearing alloy where subjected to shock and pressure, but under easier conditions it can be advantageously replaced by the alloy copper, 78.00 per cent; tin, 7.00 per cent; lead, 15.00 per cent, which is a good alloy from a sand casting standpoint.

We would suggest 80-10-10 for hard work; the 78-7-15 for medium hard work, and an alloy of copper, 70.00 per cent; tin, 5.00 per cent; zinc, 5.00 per cent; lead, 20.00 per cent, for lighter bearings. The latter alloy in its modifications is largely used for making car journal bearings. Modifications mean lead up to 22 per cent, tin lower than 5 per cent; this being the costly metal; and zinc up a little higher than 5 per cent as it is cheaper than copper, the base.

The alloy 80-10-10 is made usually by first melting the copper, in coke-fired crucibles under charcoal; in oil-fired crucible furnaces, quick melting, under nothing at all, in non-crucible furnaces it depends on the speed of melting, but a little addition of some good brass flux is the usual practice. The trick in melting such alloys is not to allow oneself to be afraid of applying heat, the more the merrier, and this is a hint to the wise. Heat fluidizes the metal, permits thorough intermingling of the molecules of the alloying metals, and drives off the gases that produce porous castings. A little so-called deoxidizer is also helpful; about 0.25 per cent of a 10 per cent phosphor-copper is ample, and it should be added, at such a time that it has a chance to do its work on the alloy before the latter is poured into the molds. After pouring is not the time to deoxidize or otherwise purify alloys. In the mold the metal must lie quietly and gently solidify and sound castings will result.

Pouring temperatures are not important; it is the manner in which the mold is made and the method by which the metal is introduced into the same that is the important feature. The pouring should be at all times done with metal completely fluid, after it has cooled near the solidifying point is too late. Good work is never done by sleepy men and good castings cannot be expected by pouring with sleepy or viscous metal.

Wants Bronze Color

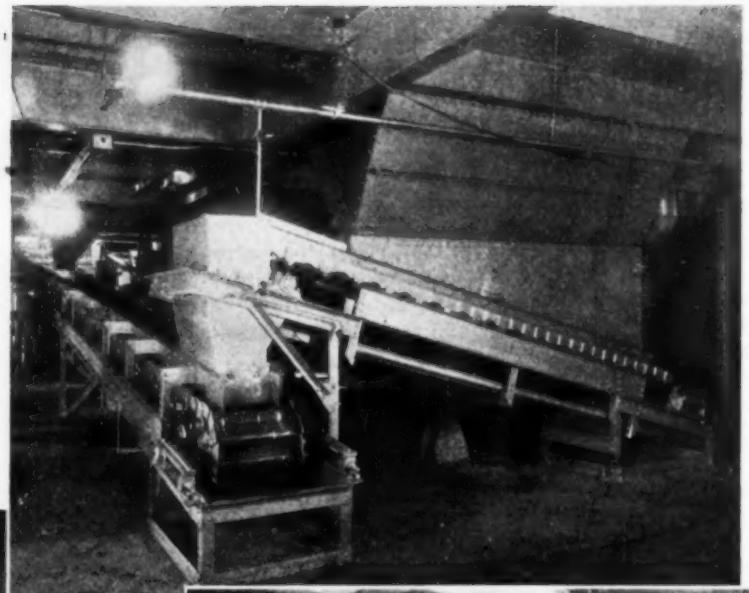
Will you please send us a formula that we can use for brass castings to give them a bronze color.

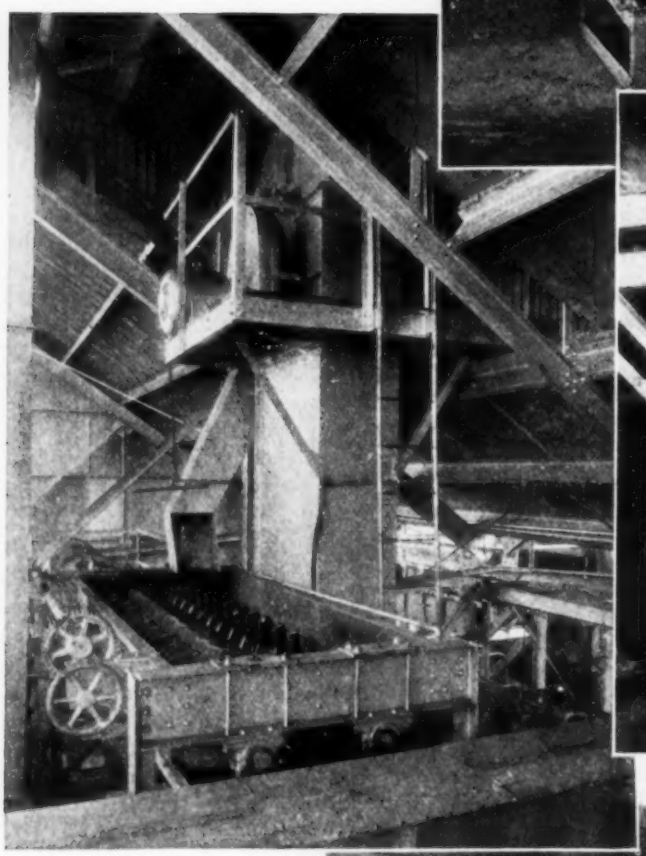
An alloy that will make finely colored castings consists of copper, 85 pounds; tin, 4 pounds; zinc, 5 pounds, and lead, 6 pounds. The castings should be taken from the sand while hot enough to blow out the cores when they are immersed in water and smartly rapped against the sides of the container, which will bring out the fine golden color of the metal.

A good color also can be obtained in the case of plumbing castings, valve bodies and waste cocks by the use of ingot provided a percentage of new metal is mixed therewith. The ingot must be low in iron and contain no phosphorus, or the merest trace thereof. About 25 per cent of new metal must be added.

Brass castings also can be given a good color by first sand blasting them and then dipping in acids, but this color will not be variegated but of dead uniform tint, and not so fine in appearance as the colors naturally produced by clean metal.

Fig. 1—Below—Sand is Reconditioned in a Pug Mill Located High Above the Foundry Floor. Fig. 2—Right—A Steel Hopper Receives the Sand as it Falls Through the Shakeout Grating in the Floor Above





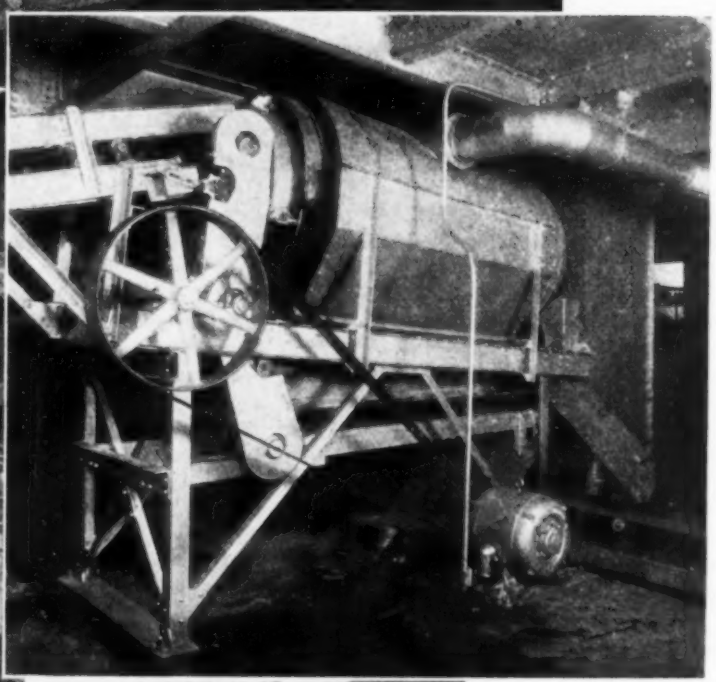


Fig. 3—Right, Above—A Pipe Connected to the Exhaust System Removes Steam and Dust from the Revolving Screen. Fig. 4—Right—Hoppers Under the Shakeout Stations Are Arranged in Pairs

Mechanical Equipment *Handles Sand in* New Buick Foundry

By Pat Dwyer

SLIGHTLY over 20 years ago—in 1904 to be exact—the Buick Motor Co., Flint, Mich., began its corporate existence. During the first year, these hardy pioneers blazing a way into an untried and mysterious territory, made and—what is more important—sold a total of 34 of the new fangled horseless carriages. By 1926 the number had risen to 1,750,000 and some time this year, probably before these words appear in print, the car known as 2,000,000 on the company's official record, will have rolled sweetly and silently from the assembly line.

Naturally, during that period many changes have taken place in methods, processes, equipment and buildings. The latest unit to be added to an already extensive plant is a gray iron foundry with an anticipated melting capacity of 700 tons per day. This foundry is to supplement the foundry which has been in existence since 1917 and which is capable of turning out approximately 300 tons per day. The new foundry will specialize exclusively in cylinders, cylinder heads, crankcases and transmission housings.

This is the second in a series of articles covering the main feature of the new Buick Motor Co. foundry at Flint, Mich. The third will appear in an early issue.

Mechanical equipment has been installed on an extremely extensive scale to do all the drudgery, incident to the operation of an industry where it is claimed 64 tons of materials have to be handled for every ton of castings produced. With only a minimum amount of attention this equipment collects, prepares and distributes the sand, fills the flasks, packs the sand, moves the molds and cores from place to place and shakes out the castings. Mechanical equipment collects the materials for the charge, weighs them and places them in the cupolas. Castings are taken away on conveyors and cleaned by mechanically operated equipment.

Probably many years will elapse before the entire foundry industry is mechanized, before the production of castings is reduced to a universal *A B C* basis so that little or no training will be required on the part of the operators, but, this new foundry of the Buick Motor Co., at Flint, Mich., is a fairly important step in this direction.

July 3, 1916 when the American Foundrymen's association was incorporated, a shovel and rammer *Or*,

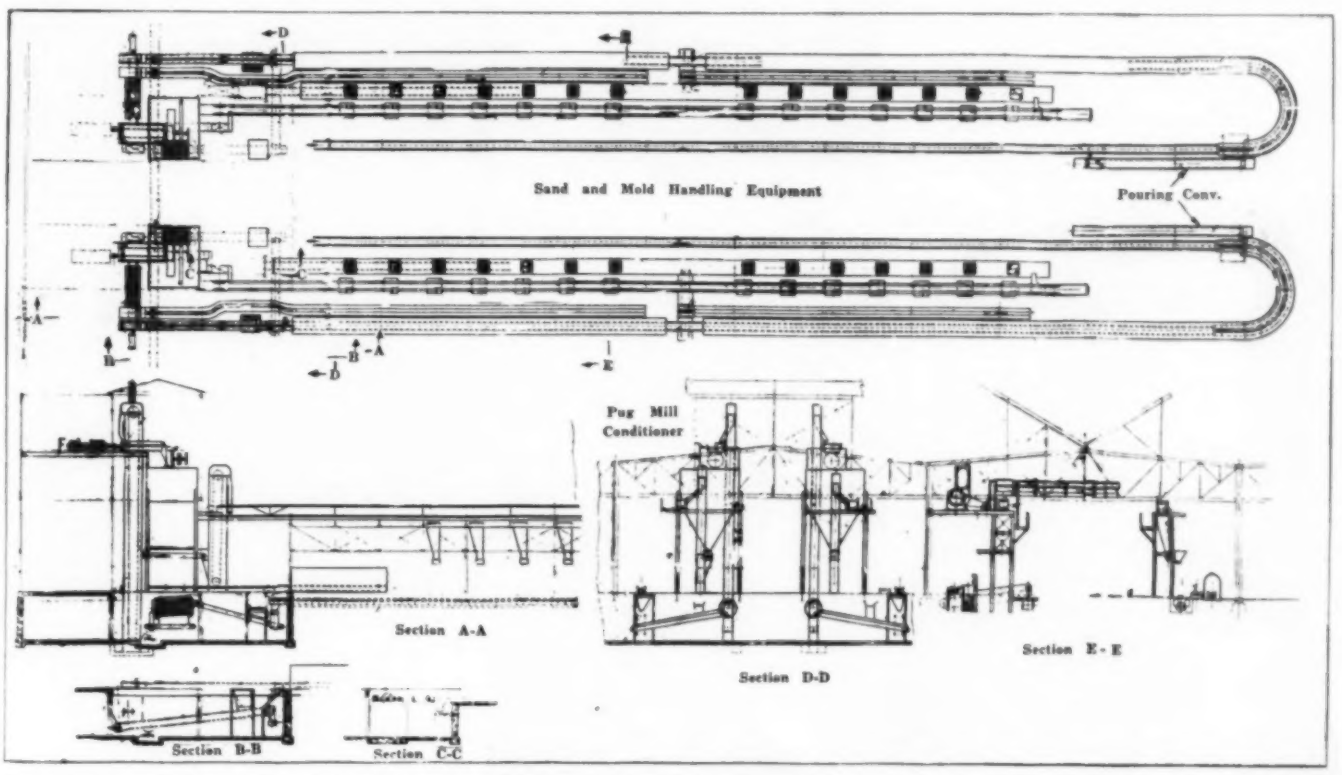


Fig. 5—Plan and Sectional Elevations Showing Detail of the Equipment Employed in Preparing the Molding Sand and Keeping It in Circulation

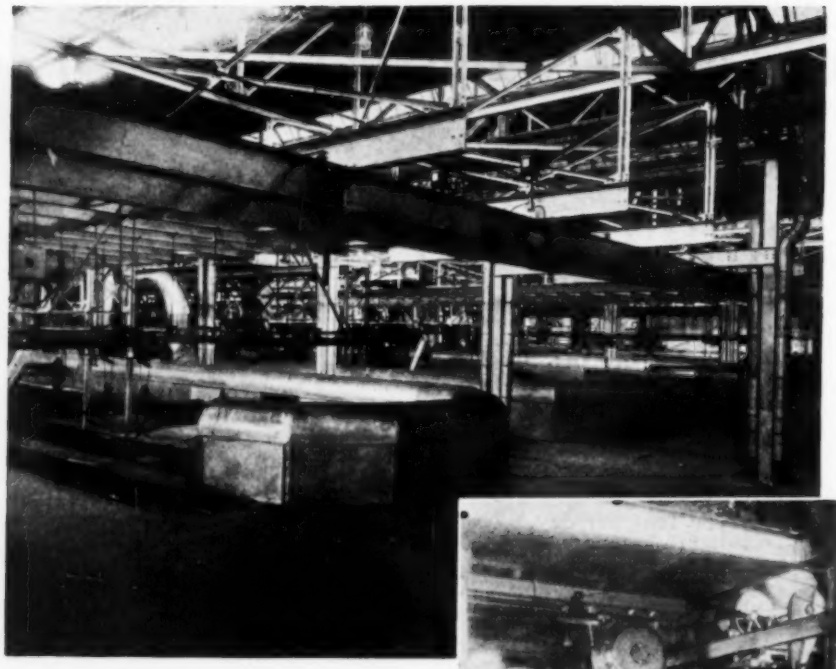


Fig. 8—Below—Elaborate Equipment Is Provided for Mixing and Preparing the Facing Sand. Commencing at the Hoppers in the Upper Right Corner the Facing Passes Over a Belt Through a Paddle Type Mixer Into the Horizontal Roller Mill in the Lower Corner

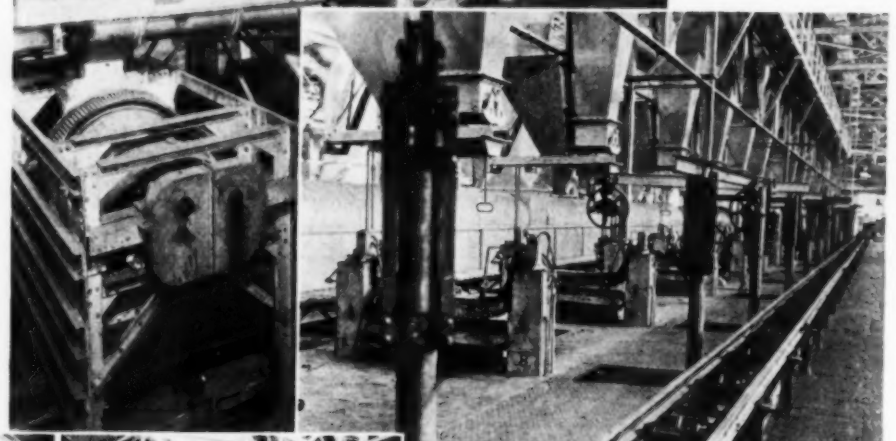


Fig. 6 — Above — General View Across the Main Gangway at the South End of the Foundry Showing Smoke Hoods Over the Mold Conveyors. Fig. 7—Below—Commencing With the Core Conveyor at the Right, the Principal Features of One Molding Unit Are Shown, Including the Mold Conveyor, Small Post Cranes, Battery of Molding Machines, Molding and Facing Sand Hoppers, Return Conveyor for Flasks and Hooded Mold Conveyor in Background

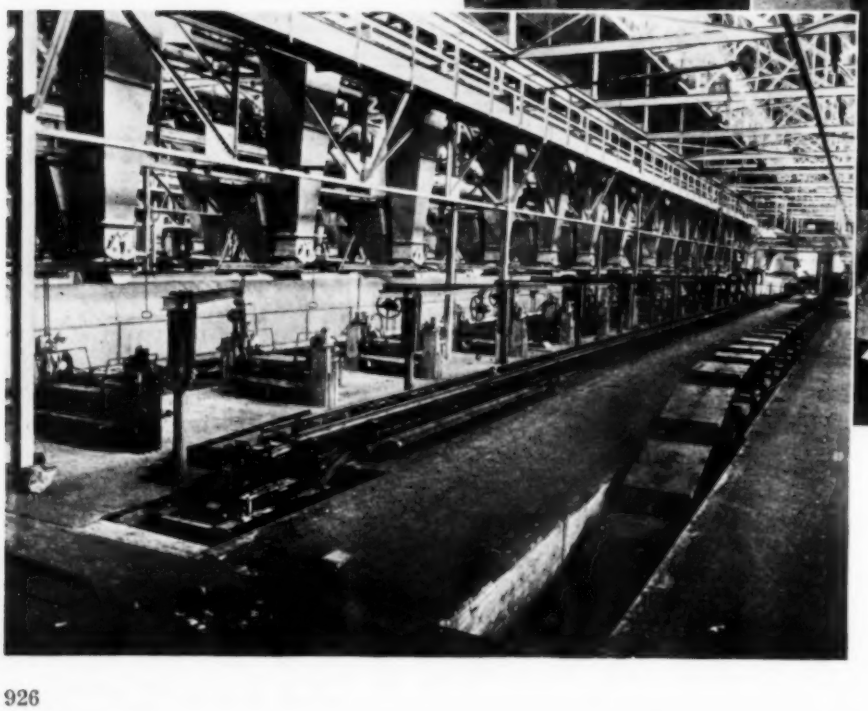


Fig. 9—Above—This View Is Similar to Fig. 7, But in Addition it Shows Details of the Sprocket and Conveyor Construction and Gratings in the Steel Plate Floor Near the Molding Machines

Rampant on a shield *Noir*, were selected as the emblem of the association. A trowel vertical was included, also the initial letters A. F. A.

For hundreds of years the shovel and rammer had constituted the most essential parts of the molder's tool kit. They were as necessary as his two hands. In selecting an emblem for the association, the committee naturally assumed that the shovel and rammer would continue to hold their place as representative and essential foundry tools. How far we have traveled from this conception is shown in this newest member in the ranks of production foundries.

Equipment of many kinds has been installed in this new foundry and every effort has been made to secure maximum production for minimum effort, but the equipment does not include a single rammer and the only use a molder has for a shovel is to clean the floor in the vicinity of his machine a few times a day. Surplus sand from the strike-off is scraped from the floor and shoveled through a grating in the floor upon a conveyor which takes it to a point where once more it is introduced to the circulating sand system.

To expedite installation of the sand handling, sand preparation and sand distribution equipment the order was divided among three firms prominently identified with that phase of the foundry industry. The C. O. Bartlett & Snow Co., Cleveland, designed and installed all the sand handling equipment for the six large molding units. The Chain Belt Co., Milwaukee supplied the facing mixer and the Link-Belt Co., Chicago erected the equipment for a twin set of conveyors on which pistons are molded and cast in green sand.

Each of these installations occupies a considerable space below the floor, and also extends a considerable distance above the floor. To a certain extent this single story building presents all the advantages of a three-story foundry. After the sand is used it is returned on conveyors located under the floor and after it has been treated and re-conditioned it is distributed to the various molding stations by an overhead conveyor which fills the hoppers above the molding machines.

The principal advantage of this arrangement is that gravity is utilized to a considerable extent both in the collection and distribution of the sand. Also, with nearly all the equipment either below or above the floor, a greater clearance is available for the actual making, assembling and pouring of the molds and castings. A rectangular casing a few feet in dimensions either way and containing the elevator which connects the upper and lower part of the sand preparation equipment, is the only evidence of a sand handling plant on an otherwise clear floor.

Plan and sectional elevation views of the sand and mold handling equipment on one of the three pairs of conveyors installed by the C. O. Bartlett & Snow Co., Cleveland are shown in the illustration Fig. 5 while photographs of several interesting units of the system are reproduced in the illustrations Figs. 1, 2, 3 and 4.

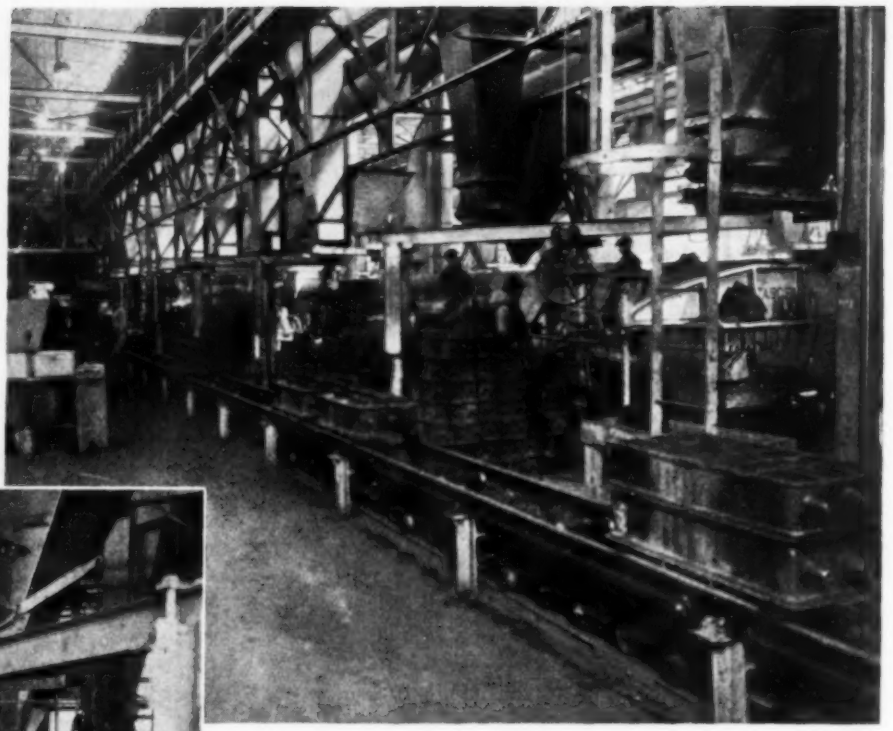
A basement, 60 x 240 feet, 12 feet high extends under the end of the building where the sand preparation equipment is contained as shown to the extreme left in Fig. 5. Section *DD* in that drawing shows how the two sand mixing units face each other to correspond with the two mold conveyor units which they serve. Each unit has a capacity of 75 tons per hour.

All the sand which flows through the system passes first through a revolving screen 48 inches diameter, 7 feet long. Sand returning from several points accounts for the various conveyors shown in sections *AA* and *BB*. Thus one stream of sand arrives on a belt which extends in a straight line under the floor between the line of molding machines and the conveyor. Loose sand struck from the tops of the molds falls through a grating in the floor and upon the belt which takes it back to the revolving screen. The far end of the conveyor catches any overflow sand that spills from the end of the upper flight conveyor which supplies the hoppers back of the molding machines.

The greatest amount of sand naturally comes from the cope and drag shakeout stations as shown in the plan view, also in sections *BB* and

Fig. 10—Shakeout End of One of the Units. Fig. 11—The Machine Jolts the Mold, Rolls It Over, Draws the Pattern and Places the Flask on a Swinging Table Within Reach of a Small Crane Which Places It on the Conveyor

DD. From these various illustrations it will be seen that each set of sand conveyors in the basement occupies four sides of a square with the revolving screen at one corner as a final receiving point. Assuming that the screen occupies the north east corner of the rectangle, sand from the drag shakeout falls first upon a belt which carries it west to a second conveyor traveling south and which passes under the cope shakeout at a point near the southwest corner of the square. At the corner, the sand is passed to a belt running east to the third corner of the square and about half way in its passage passes



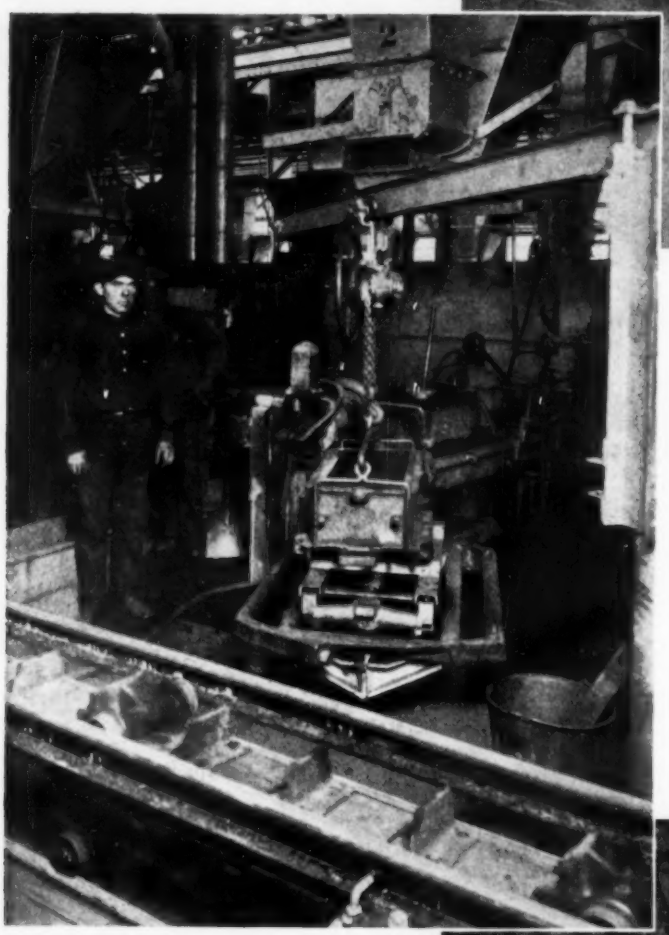


Fig. 12—Left—Cylinder Heads Require No Copes. They Are Lifted from the Leveling Table to the Conveyor Where Each One Is Covered by a Suitable Dry Sand Core. Fig 13.—Above—Cylinder Flasks Mounted on Perforated Steel Plates Slide on Rails While the Weight of the Conveying Mechanism is Taken on Small Rollers. The Upright Members of the Conveyor Act Merely as Pushers. Fig. 14—Below—A Number of Copes for the Piston Molds Are Made in Advance and Are Placed on the Drags as They Pass on Their Way to the Pouring Station

under the belt bringing the strike-off and surplus sand from the molding floor. At the south east corner the sand is transferred to a belt traveling north and discharging into the revolving screen. On the way the belt passes under a hopper containing new sand or other form of bonding agent. A special feeder developed by the makers is attached to the bottom of the hopper and may be adjusted to feed a definite amount of material. At the present writing a proprietary clay in the form of a fine powder is employed instead of new sand to renew the bond in the molding sand and maintain it in workable condition.

After the sand from the various

IRON AND STEEL ALLOYING MATERIALS

(*Continued from Data Sheet No.* 694)

MELTING RANGES OF ALLOYS

MATERIAL	Bureau of Standards Degrees	Other Observers Centigrade
Aluminum, Pure	659	659[3]
Boron, Pure	2200-2500?	....
Chromium, Pure	1615	....
Chromium, Ferro 97-98 per cent Carbon Free	1519	1515[1]
Chromium, Ferro 60 per cent Carbon Free	1395	1382[1]
Chromium, Ferro 65-70 per cent Carbon 2 per cent	1402-1560	1500[2]
Chromium, Ferro 65-70 per cent Carbon 5 per cent	1333-1516	....
Chromium, Ferro 67 per cent Carbon 6 per cent	....	1200-1300[2]
Chromium, Ferro 65-70 per cent Carbon 10 per cent	1301-1600	....
Cobalt, Pure	1480	....
Cobalt, Ferro Carbon Free	1475	1475[1]
Iron, Pure	1530	....
Iron, Wrought Carbon 0.06 per cent Slag 1.0 per cent	....	1600[11]
Iron, Foundry Carbon 3.50 per cent Silicon 1.75 per cent	....	1220[7]
Iron, Foundry Carbon 3.33 per cent Silicon 1.82 per cent	1160-1210	....
Iron, White Carbon 4.00 per cent	1125-1162	1135[7]
Steel, Soft Carbon 0.10 per cent Manganese 0.30 per cent	....	1475[7]
Steel, Medium Carbon 0.30 per cent Manganese 0.20 per cent	1300-1485	1455[7]
Steel, Medium Carbon 0.52 per cent	1275-1470	....
Steel, Hard Carbon 0.90 per cent Manganese 0.10 per cent	1215-1415	1410[7]
Steel, Hard Carbon 1.15 per cent	1120-1370	....
Manganese, Pure	1230	....
Manganese, Ferro 95-98 per cent Carbon Free	1225	1225[1]
Manganese, Ferro 80 per cent Carbon 6.0 per cent	1255-1263	1250-1275[4]
Manganese, Spiegel 20 per cent	1070-1240	....
Manganese, Titanium 55 per cent Titanium 30 per cent	....	1205[1]
Manganese Steel 12 per cent Carbon 1.25 per cent	....	1260-1343[12]
Molybdenum, Pure	2550	....
Molybdenum, Ferro 67 per cent Carbon 0.30 per cent	....	1630[5]
Molybdenum, Ferro 60 per cent Carbon 0.30 per cent	....	1630[2]
Molybdenum, Ferro 59 per cent Carbon 0.60 per cent	....	1465[5]
Molybdenum, Ferro 53 per cent Carbon 1.50 per cent	....	1455[6]
Molybdenum, Ferro 50 per cent Carbon 2.00 per cent	....	1450[2]
Molybdenum, Ferro 60 per cent Carbon 2.00 per cent	....	1510[1]

(*Continued on Data Sheet No.* 696)

IRON AND STEEL ALLOYING MATERIALS

(*Continued from Data Sheet No.* 695)

MELTING RANGES OF ALLOYS

MATERIAL	Bureau of Standards Degrees	Other Observers Centigrade
Nickel, Pure	1452.	....
Nickel, Grade A 99 per cent Carbon 0.10 per cent	....	1445[10]
Nickel, Grade D 96 per cent Manganese 3.00 per cent	....	1430[10]
Silicon, Pure	1420	....
Silicon, Ferro 15 per cent	....	1280[2]
Silicon, Ferro 33 per cent	1322-1497	....
Silicon, Ferro 50 per cent	....	1360[2]
Silicon, Ferro 60 per cent	....	1250[2]
Silicon, Ferro 75 per cent	....	1360[8]
Silicon, Ferro 92 per cent	1330-1418	....
Titanium, Pure	1850	....
Titanium, Ferro 25 per cent Carbon Free	....	1204[1]
Titanium, Ferro 25 per cent Metal	1772	....
Titanium, Ferro 16 per cent Carbon 7.50 per cent	....	1400-1450[6]
Tungsten, Pure	3400	....
Tungsten, Ferro 80 per cent Carbon Free	....	2600[3]
Tungsten, Ferro 80 per cent Carbon unknown	....	1800-1900[2]
Uranium, Pure	1850	....
Uranium, Ferro 35 per cent Carbon 1.0 per cent	....	1600?[3]
Vanadium, Pure	1720	....
Vanadium, Ferro 35 per cent	....	1525?[8]
Vanadium, Ferro 33 per cent High Silicon	....	1250[9]
Vanadium, Ferro 33 per cent Low Silicon	....	1400[9]
Vanadium, Ferro 15 per cent Carbon Free	1620	....
Zirconium, Pure	1700?	....

References

1. Metal and Thermit Corp.
2. Massachusetts Institute of Technology.
3. Ajax Electrothermic Corp.
4. National Alloy Co.
5. Climax Molybdenum Co.
6. Titanium Alloy Mfg. Co.
7. Chemical Met. Handbook.
8. Standard Alloys Co.
9. Vanadium Corp. of America.
10. International Nickel Co.
11. Western Electric Co.
12. U. S. Navy Yard, J. Strauss.

(*Continued on Data Sheet No.* 697)

THE FOUNDRY DATA SHEET, DEC. 1, 1927
Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

points has passed through the revolving screen it is discharged by belt into the boot of a elevator and taken up as shown in sections *AA* and *DD* Fig. 5. A magnetic pulley removes all scrap from the sand before it enters the elevator. Sand from the elevator is discharged into a pug mill equipped with two sets of revolving paddles and located 32 feet 8 inches above the foundry floor. As the sand travels through the pug mill it is discharged automatically at one end into a lantern wheel which breaks up all lumps and aerates the sand before it falls into a storage tank with a capacity of 150 tons.

A cutting feeder on the bottom of the storage tank which may be regulated to meet varying demands, transfers the prepared sand to the boot of an adjoining elevator. Here it is hoisted as may be noted in the section *AA* and discharged upon a flight conveyor which supplies the storage hoppers at the various molding stations.

The foregoing somewhat detailed description applies to a single sand preparation unit. Six of these units have been installed, one for each of the conveyor units on which castings are made. They have been erected in pairs, right and left as shown in the sectional view *DD*, Fig. 5 to correspond to the relative position of each pair of mold conveyors.

Use Crane and Bucket

Facing sand is prepared in a building adjoining the foundry near one end at the east side. The greater part of the building is occupied by core sand storage bins and the bins designed for the reception of new molding sand. The building is served by a crane and bucket for unloading the sand from the railroad cars and for transferring it later to any desired point. Equipment for preparing the facing is located near the south end of the building and in line with the steel floored gangway extending all the way across the foundry at the end where it is separated from the core making department. The gangway is utilized by trucks bearing loads of old sand into the room where the facing is prepared. The trucks are equipped with dump bodies and the drivers run up close and discharge the loads of sand into a pit in the floor.

Equipment for preparing the facing sand was supplied by the Chain Belt Co., Milwaukee and is made up of two independent units erected side by side. Each one is an exact duplicate of the other. Therefore, a description of one will serve for both. The equipment is driven by a number of individual electric motors enclosed in dust proof hoods and controlled from a panel attached to the frame facing the gangway.

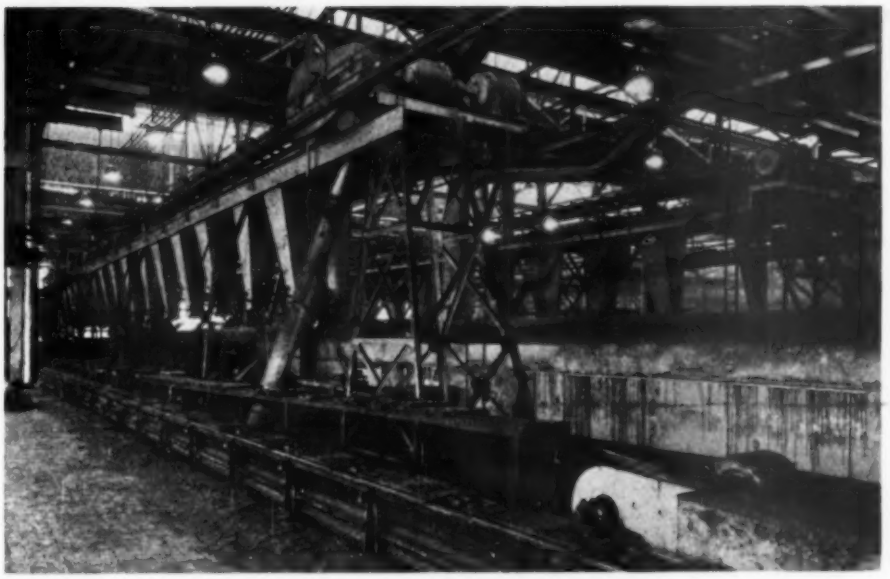


Fig. 15—*General View of the Piston Molding Unit from the Pouring Station*

Two 6-foot diameter hoppers receive old and new sand respectively and conduct it to two horizontal plates revolving at a speed that will deliver the sand in definite quantity and in definite proportion. The plate forms the bottom of the hopper, but is separated from it at the bottom by a narrow opening through which the descending sand is forced by a plow. Where no new sand is needed, the second hopper is loaded with old sand so that the volume of sand on the belt will not be reduced. Occasionally, when the sand shows a tendency to become overbonded, a small quantity of silica sand is added to the mixture through the second hopper. A crane and grab bucket are employed to fill the hoppers.

The horizontal belt bearing the sand from under the hoppers passes under two smaller hoppers loaded respectively with coal dust and a proprietary clay. Feeding mechanism on these hoppers add sea coal to the sand in the ratio of 1 to 16 and clay in the proportion of 1 part clay to 40 parts sand. The belt bearing the mixture continues a short distance farther and discharges it into a steel trough where the sand is subjected to the intense mixing action of two sets of paddles working in parallel and toward each other and with the combined action driving the sand toward the far end where it is discharged into a chute leading to a horizontal mill.

A water spray under the care of a reliable attendant adds approximately the correct amount of moisture to the sand in the paddle mixer. A supplementary spraying device is located at a more advanced stage of the process, and if necessary a little more moisture is added at that point.

The mill shown to the lower left in Fig. 7 into which the sand falls from

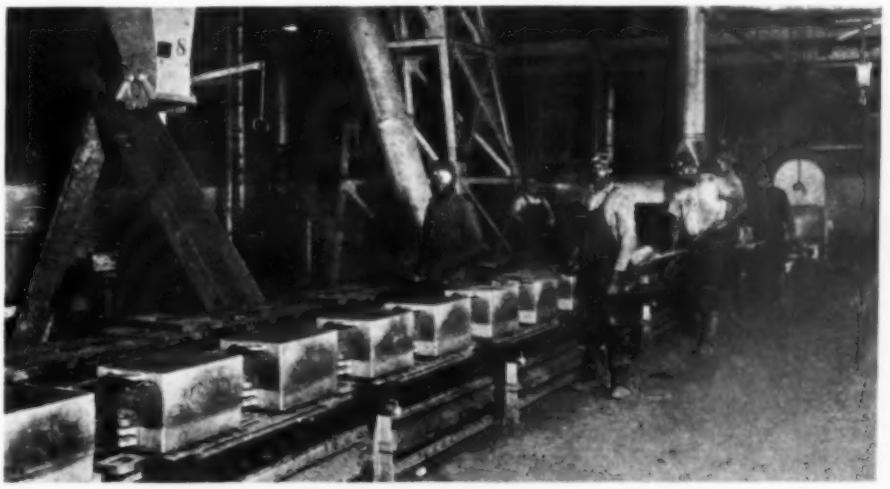


Fig. 16—*Weights Are Removed Immediately After the Molds Are Poured and Returned to the Pouring Station*

the paddle mixer is unique among the many devices developed from time to time for manipulating molding sand. Briefly, it consists of a pair of rolls mounted horizontally in a drum with lifting blades. Sand is dropped on the rolls at one end and is mulled by its passage through the revolving rolls. After the sand has dropped to the lower part of the revolving drum surrounding the rolls, it is lifted by the blades and again dropped through the rolls. The operation is repeated several times before the sand finally reaches the opposite end of the drum to that at which it entered. Here it is discharged in a continuous stream and in a thoroughly mulled condition.

Sand from the mill falls upon a belt under the discharge end which deposits it in the boot of an elevator. Leaving the elevator it is sprayed if necessary and then passed through a whirling screen into a storage tank. From the tank it is loaded into buckets suspended from a monorail and taken to the various molding stations where the facing is transferred to the small storage tanks provided for the purpose.

Manner in which the molding sand and facing sand hoppers are arranged over the molding machines may be noted in the section *EE*, Fig. 5 and perhaps more clearly in Figs. 8 and 9, where the small facing hopper is shown immediately back of the comparatively high molding sand containers. The gate of the molding sand hopper is located directly above the center of the molding machine table so that a pull on the lever will fill the flask with sand. Manifestly the outlet of the facing sand hopper could not be located over the same central point. The problem was solved by placing an air-operated sliding pan under the facing sand tank. The pan is loaded with facing sand and pushed forward to a point where the sand may be dropped upon the waiting pattern. The pan then is pulled back out of the way and the gates of the molding sand hopper are opened for the stream of sand that fills the flask.

General layout of the foundry floor was shown in an illustration which appeared in THE FOUNDRY, Nov. 1. Twin conveying units occupy one end of the building extending almost from one side to the other in front of the battery of six cupolas and equipped in a special manner for the production of piston castings. The remainder of the floor space is occupied by six practically duplicate molding units extending longitudinally parallel with the walls of the building and grouped in pairs for convenience in distribution of cores and other materials. Commencing at the west side and taking the various units in regular order they are equipped for the production of: 1—Transmission housings; 2—Heads or cylinders; 3—Heads; 4—Cylinders; 5 and 6—Crankcases.

Each of the piston making units is equipped with six drag and six cope molding machines made by the Arcade Manufacturing Co., Freeport, Ill., from which the daily output is 3200 castings. The machines are erected in a straight row commencing with the drag machines. Sand is poured into the flasks from a row of overhead hoppers equipped with hand operated bottom gates in the manner that has been fairly standardized in recent years. The pattern plate on which the drag is rammed contains cavities for forming four cores. Thus cores and drags are rammed at one time. A small cross with a short vent wire attached to the extremity of each arm is utilized for venting the four cores at one time before the drag is rolled over. The device is suspended from a spring which pulls it up out of the way when it is released.

Drags with cores standing in place are lifted from the machines and arranged on the plates of a power driven conveyor which carries them past the cope making machines. After the sand is rammed in each cope the patterns are dropped through a stripping plate and the cope is lifted directly from the machine to one of the drags on the conveyor. A bench is provided in the vicinity of each machine for the reception of several flasks in the event that the steady flow of production is held up temporarily at any point along the line.

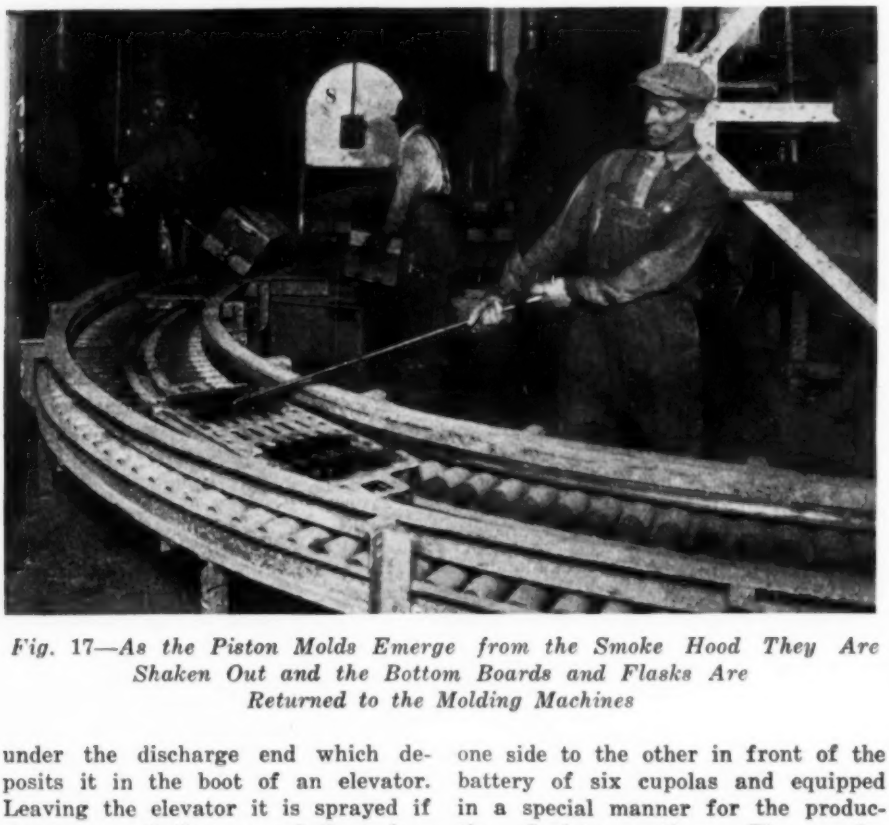


Fig. 17—As the Piston Molds Emerge from the Smoke Hood They Are Shaken Out and the Bottom Boards and Flasks Are Returned to the Molding Machines

Have Separate Gangs

Work is divided among many men. Thus one gang does nothing but operate the molding machines. A second group transfers the drags to the conveyors. A third group closes the copes on the drags. One man places the weights in place as the molds pass his station and another man removes the same weights and returns them to the first man on a roller conveyor after they have served their purpose. Iron is brought from the cupola in a 1-ton ladle suspended from a monorail and poured into a second similar ladle mounted on a stationary stand on the floor. A special pouring gang takes the iron in hand ladles filled at the stationary ladle and fills the molds. The men wear safety leggins and goggles and in a short time become exceedingly fast and proficient in handling the molten metal.

Molds are dumped a short distance from where they are poured. The sand falls through a grating in the floor upon a belt which takes it back to the sand rejuvenation station at the opposite end of the conveyor unit. Here it is prepared for use in a manner somewhat similar to that described previously and discharged on to a belt which distributes it to the various supply hoppers located over the molding machines. The empty flasks remain on the conveyor and are

lifted off as they arrive at the molding stations. The plates are attached permanently to the conveyor chain and slide on a pair of rails.

The second unit of the pair is equipped and operated in a similar manner so that the total piston producing capacity of the foundry is approximately 6400 per day.

Only a Few Lines

The new foundry was designed and equipped specifically to handle nothing but pistons, cylinder blocks, cylinder heads, transmission housings and crankcases. Two units are devoted to the production of crankcases and are equipped with molding machines made by the International Molding Machine Co., Chicago. At various periods this company has supplied many machines to the Buick Co., for use in the former foundry, the present foundry and the core rooms in both places. The latest compilation shows a total of over 200.

Cylinder blocks, cylinder heads and transmission housings are made on four molding units on machines made by the Tabor Manufacturing Co., Philadelphia. The machines in each instance are arranged in a straight line between the two members of a power driven conveyor 300 feet in length. One of the units is shown in Fig. 7. It is typical of the others with the mold conveying mechanism in the foreground, the battery of molding machines and small post cranes for transferring the molds from the machines to the conveyor immediately back of the conveyor. Sand and facing sand hoppers are shown, one over each molding machine. The curved, continuous hood in the back ground houses the second member of the conveyor and prevents smoke and gas from the poured molds from annoying the workmen. The hood is connected to a powerful exhaust system which discharges the smoke outside the building. The conveyor shown to the right in the same illustration brings the cores from the core making department and serves two molding units.

Drag molds for cylinder heads, cylinder blocks and transmission housings are made on jolt machines fitted with rollover and patterndrawing equipment. The mold afterward is swung out on a table from which it is lifted by a small post crane and placed on the conveyor. Cylinder blocks and transmission housings are made from split patterns, therefore a battery of six cope machines is required to match the output of the six drag machines. Drags alone are made for the cylinder heads. The cope takes the form of a covering core which fits into a suitable print in which it is held by a flat yoke across the top. Special clamps with a cam at the upper end engage the yoke and hold it in place.

Drag molds for the cylinder blocks are made on a type of jar ramming, shockless, rollover pattern draw machine specially built by the Tabor Mfg. Co., Philadelphia, for this new Buick installation. The machines present many interesting features including elimination of all shock from the foundation during the jarring operation. Extension on both sides of the base support two upright, dust-proof housings that enclose two, air-oil actuated, rollover cylinders and pistons that in turn are coupled to and operate a rack and pinion driving gear for rotating the rollover table. By using air on oil it is claimed a positive cushion is obtained at each end of the rollover travel that permits high rollover speed without danger of cracking molds or breakage of the rollover mechanism.

Special Clamps

Air operated clamps are employed to clamp the sand frame and flask to the rollover table during the jarring operation. The same clamps are employed to hold the bottom board and drag in place during the rolling process. Ingenious construction features in these clamps enable them to lock and unlock instantly over a wide range of distances. After the drag is rolled over the pattern is drawn and the drag is placed on a swinging frame from which it is lifted by a small crane and placed on the conveyor. These machines are designed to function at normal speed on air pressure as low as 65 pounds. The sequence of operation readily fits in with a crew of three men who turn out molds at the rate of one per minute. All machine operations are controlled by one man at the valve stand attached to the right hand housing of the machine.

Cope molds are made on a battery of somewhat similar machines. The jarring mechanism is of the same type as that in the drag machine, but in addition the cope machine is fitted with squeezing mechanism and the flask is not rolled over. A suitable device on the machine lifts the mold away from the pattern. A crew of three men operates each of the cope machines and maintains a production of one cope per minute to match the production on each of the drag machines. Green sand runner basins are made on jolt-squeeze machines also supplied by the Tabor Mfg. Co.

Radiator Foundry Needs Sand Control

(*Concluded from Page* 918)

same time it was necessary to have a rig that was flexible and one that could be moved easily from one rack of molds to another. An idea of the construction of the rig may be obtained from Fig. 1. The entire device is supported by a block and trolley. It consists of a steel frame which is attached to the block by four chains, one being attached at each corner. Eight loops are attached along each side of the steel frame as may be noted in the illustration. The weight consists of a heavy plate having four eyes, two at each end, which are fastened through the loops on the steel frame. This construction makes each weight flexible and as the rig is lowered to the molds, the four weights will rest entirely on the top mold. The top two molds will weight the lower mold so that it is necessary to supply only sufficient weight to hold the top two molds.

After the molds are poured, the stack of molds on the rack is taken on the electric lift truck to the opposite side of the bay where the racks are placed while the castings cool. The racks then are picked up by the lift trucks and taken to a position before the shakeout hopper, as shown in Fig. 10. The molds are picked up by a special rig, carried over the shakeout hopper and the sand and casting knocked from the flasks by three men. The molds are raised by a large pneumatic hoist which is supported by a crane carriage running on two structural beams. As may be noted in Fig. 10, the rig consists of a pipe frame attached to the hoist by four chains. Chains from each corner of the frame support an iron bar, shown plainly in the illustration, and this bar fits under the lower handles of the bottom row of molds and thus lifts the entire stack. The sand is knocked out by bars and the empty flasks placed on the truck and returned to the molding floor by the electric truck. The castings are picked from the grating and thrown into wheelbarrows which are placed at the left of the shakeout hopper.

The castings then are wheeled to the cleaning room which is located in a building immediately adjacent to the radiator shop. The castings are tumbled, chipped where necessary and sent to the reaming department in the next room. Six tumbling barrels made by the W. W. Sly Mfg. Co., Cleveland, are used in the cleaning department.

INDUSTRY MUST RALLY
To Meet
The NEW COMPETITION

By Charles F. Abbott

AT THE present time there are two economic forces at work which are of vital importance to industry as a whole. Both of these forces can be grouped under the head of *The New Competition.* We can remember the time when competition was confined chiefly to concerns in the same line of business. Today we see whole industries organized for encroachment upon each other's markets. Tomorrow we almost certainly shall begin to feel the effects of intensive competition of a still wider scope—whole nations, or groups of nations, organized against each other for the conquest of the markets of the world. These are the forces which constitute the new competition.

I do not want to pose an alarmist, but, in my opinion, methods now in use in many cases, will not prove adequate to cope with the competition between industries. C. J. Stark, president, the Penton Publishing Co., Cleveland, has summarized the past and present situation in these words:

"The great influx of population into the United States, together with the tremendous development of natural resources that followed, created a commercial condition in the past akin to that of a new and great mining camp, where demand runs in excess of supply. In such an atmosphere we find brusqueness (in distributors and employes), waste in various forms, lackadaisical business methods, and a general 'free and easy' way of swinging along that permits pretty nearly all to 'get by'.

"As the 'camp' steadies up and becomes a town, and then a city, one can follow the psychological change wrought. Courtesy becomes more general; the wastes of old are eliminated; business service begins to be given, and the incompetent begin to be eliminated."

"The United States has entered its 'steadying' stage. Business is not going to be so easy an affair as it has been. The unfit will be eliminated, and the fittest will survive. Distributive and selling brains will be demanded in this new area. It is close upon us."

What are the methods which are handicapping our present prosperity and which may menace our future welfare? What are we to do to improve these methods, or substitute others in their place?

Factors of production and finance need not concern us greatly, for the present, at least. In the efficient organization of the factory and the use of the machine, we are in advance of all other nations. We are able to produce more than we can sell. It is to the many elements involved in merchandising that we must turn our attention. In this field, outworn methods, worthy only of the horse-trader, are still prevalent.

Let me outline a program which should bring our merchandising up to the plane of our production and finance. Here is my suggested program:

Employ research to obtain a true conception of the market, develop new uses, and aid in the cultivation of both old markets and new.

Use increased care in the selection, training and supervision of salesmen.

Base the sales approach upon the service the products will render rather than upon price per unit.

Establish and maintain sales prices in accordance with the fundamental law of costs plus a fair profit.

Take advantage of the tremendous possibilities offered by the intelligent use of well prepared advertising.

Organize the industry on a cooperative basis, that it may undertake those activities which the individual concern may not be in a position to assume.

Research, involving a survey of the market and the adaptation of the product to meet the needs and wants of the prospective buyers, provides one of the best guarantees of success in any effort to cultivate old markets more intensively, or to develop new ones. Lack of such research frequently is disastrous.

The present high cost of distribution can be reduced greatly by devoting greater care to the selection, training and supervision of salesmen. I recently wrote to a number of leading sales executives, asking them to outline for me their views on this subject. The replies strengthened my convictions as to its importance.

The wisdom of basing the sales approach upon service rather than

Causes Are Parallel

THE foundry industry today is meeting keen competition from several other metalworking industries. Aided by publicity in the business and daily press, manufacturers of competing lines have succeeded to a degree in prejudicing the buying public, which includes the engineer, the manufacturer and the ultimate consumer, against cast parts. The situation in the foundry industry is only a duplication of the difficulties which have been encountered by other industries, many of which have succeeded in meeting the competition and now find the demand for their products even greater than in the past. In developing the campaign, which ultimately must follow, to regain lost markets and develop new fields for castings, foundrymen may learn many valuable lessons by studying the organization work which has been carried on in other industrial fields. This article is abstracted from a paper presented at the Chicago meeting of the Associated Business Papers, Inc., Oct. 17, and tells of some work which has been carried on by the manufacturers of structural steel to secure better merchandising methods. The author is executive director of the American Institute of Steel Construction, Inc., New York.—THE EDITORS.

price has been emphatically demonstrated by the come-back of the gas industry. In spite of the fact that one of its most profitable markets virtually was wiped out by the invasion of electricity, the gas industry has extended the use of gas for industrial and domestic purposes to the point where more of this fuel is used than when homes depended on gas for their illumination.

I have received a letter from George H. Charls, commissioner, the Hot Rolled Strip Steel institute. This letter reads, in part, as follows:

"Excessive productive capacity and the apparent inability to resist the moss-covered impulse of operating the plants to capacity when the demand is not there, has resulted in a price situation which so impairs the profits as to give the independent steel companies a return on their enormous investment of less than 6 per cent. . . . There exists the . . . prime necessity of the individual manufacturer to sell his share of the total demand at a profit, whether it equals 50 per cent or 75 per cent of his production."

The whole structure of business is built upon service at a profit and not upon the mere exchange of commodities. If Moses had given us eleven commandments instead of ten, the eleventh might well have been, "Establish the sale price on a proper basis and uphold that price."

The chairman of the British Federation of Iron, Steel & Metal Merchants has been quoted as saying:

"The great need of the business world today is a sound price, a price which bears direct relationship to economic facts. It is the discovery of that price which constitutes our biggest problem."

It is true that the determination of the sales price is a complicated matter. Depreciation, overhead, insurance, the cost of raw materials, labor, and a score of other factors must be taken into consideration. Nevertheless, there is one law that points the way. The sales price always should equal total cost plus a legitimate profit.

Situation Is Bad

So obvious is the necessity of obedience to this law that the man unacquainted with the intricacies of business is prone to believe that it is respected universally. He is unable to understand that any man in his right senses could disobey it. But what do we find? We find that no law is more frequently broken than this one.

The situation is bad enough when there is no dependable cost accounting system—when the manufacturer is forced to guess about his costs. But again and again, in cases where elaborate cost accounting systems are in effect, the proper formula for the determination of the sales price is dissipated in an attempt to get the business at any price.

If a plant needs business and it is thought that a competitor is quoting a certain price, the cost is disregarded, the question of a profit is brushed aside, and a bid is put in, which it is believed will be lower than the competitor's. That the order may lose the bidder thousands of dollars is not regarded as so important as the fact that competition will be beaten.

An added touch, not far from the ridiculous, is given when the seller will not stick to his first price, even though it may be so low as to make a loss almost inevitable.

The practice of selling without profit is as much against the interests of the buyer as it is against the interests of the seller. When an order is placed at a cost price, or at a price less than cost, the seller is presented with an almost irresistible temptation to save himself from loss by supplying material below the proper standard of quality, by substitution, by careless workmanship, or by neglecting the element of service. Wise is the buyer who realizes that he gets what he pays for—no more and no less.

Condemns Practice

The National Association of Purchasing Agents has condemned the practice of playing one seller against another to obtain cut prices. L. F. Boffey, editor, *The Purchasing Agent*, through his publication, has played a leading part in a campaign to eliminate this vicious and unethical procedure. Mr. Boffey has written me a letter in which he says:

"Every purchasing agent worthy of his title will support a movement to eliminate price haggling in industry . . . The salesman who changes his quotation admits that his original figure was too high, and the purchasing agent is chary of dealing with him because he can never be sure that the last figure named is the rock-bottom price . . . The buyer is concerned with price, of course. He wants to pay a reasonable profit, and no more than a reasonable profit, to his source of supply."

Although I am not an advertising man, I believe as firmly as does the most enthusiastic member of that profession that advertising is one of the most constructive economic forces in existence today. Intelligently directed, it will tend to stabilize prices, improve profits, and smooth the road for the salesman.

In this connection, I might cite the experience of the industry with which I am associated, the industry that fabricates steel for use in the erection of buildings and bridges. Until a few years ago, the structural steel industry virtually was helpless in the struggle against steady encroachments upon its market.

The displacement of steel by well organized competition represented, and still represents, a large tonnage. Bridge construction affords a glaring example of the effects of the inertia of the steel interests. Skillful advertising and publicity by competitors has stamped the public mind with the conviction that artistic appearance and durability are qualities possessed solely by their product as used in bridge construction. The facts controvert this belief, but facts carry little weight when they are kept from the public view, buried under a mass of technical phraseology.

Neglected Merchandising

While their market was slipping away from them, the fabricators of structural steel were engaged in a struggle among themselves for orders that were scarcely worth taking at the price at which they were accepted. The solicitation of business was based upon the price, which was altered frequently if by so doing there seemed a better chance of getting the contract. Merchandising in the real sense of the word was grossly neglected.

In 1921, fabricators in the United States and Canada organized to form the American Institute of Steel Construction. The succeeding years have seen a marvelous change for the better in the industry. Some of the evils remain, but the co-operation association of the industry is achieving results that no individual fabricator could hope to obtain.

A concerted effort is being made to eliminate the system of submitting bids formulated in accordance with the vicious policy of trying to outguess competition. An increasing number of the sellers of structural steel are submitting one, unalterable bid, prepared with due regard to the formula of cost plus legitimate profit.

Every effort is being made to throw the spotlight upon what structural steel does and can do, upon its adaptibility to specific uses, rather than upon price. A national advertising campaign is bringing home the outstanding advantage of steel to the general public and the technical professions. Plans are being drawn for a conclusive demonstration, through advertising, of the permanence and

artistic possibilities of steel in bridge construction.

No sales manager of any particular fabricating plant was in a position to cope single-handed with the encroachment of competing products. The individual is helpless when the forces of an organized industry are marshalled against him. National advertising and research to increase the markets for steel through the whole of the United States and Canada could not be financed by any one plant.

Such activities had to be left to an association that would direct its efforts toward the common good. The value of similar co-operative effort has been demonstrated by many other industries. The research and advertising of the gas industry, the copper and brass industry, the concrete industry, the common brick manufacturers, and the manufacturers of paints, oils, and varnishes, have all been conducted by trade associations.

Malleable Refractories Standards Set

A simplified practice recommendation covering definite sizes, shapes and types of malleable refractories was adopted at a conference held under the auspices of the division of simplified practice, department of commerce at Washington, Nov. 10, and attended by manufacturers, distributors and consumers of refractories. The recommendation becomes effective Feb. 1, 1928, for one year and is subject to annual revision by the interested parties.

Five years ago the American Foundrymen's association first requested the division of simplified practice, department of commerce, to undertake the work of simplification and the adopted recommendation is the work of this division, the joint committee on foundry refractories and its various associated subcommittees.

According to James R. Allan, International Harvester Co., Chicago, chairman of the subcommittee largely responsible for the standards, this initial step for the betterment of foundry practice will be of great advantage to manufacturers, distributors and users and opens the door to further simplifications.

Typical of the elimination of sizes, the variations in tap-out blocks are reduced from 150 to 2, shapes for side walls, bridge walls, etc. from 27 to 8, and shapes for bungs from 11 to 5. No reductions have been adopted for circle bricks for stacks, while the standards for door opening tile are new.

The present subcommittee on malleable foundry refractories will serve as the standing committee for the simplified practice recommendation. Its members are H. M. Thompson, chairman, president of the H. M. Thompson Co., Chicago; H. M. Birdsong, metallurgist, Buffalo; James R. Allan, International Harvester Co., Chicago.

Those attending the meeting at which the standards were adopted were:

Lieut. J. T. Bottom, navy department; R. A. Heindle, bureau of standards, Washington; H. R. Colwell, division of simplified practice, Washington; W. H. Funk and Fred A. Harvey, Harbison-Walker Refractories Co., Pittsburgh; James T. MacKeazie, American Cast Iron Pipe Co., Birmingham, Ala.; Paul G. Willettes, Hartford-Empire Co., Hartford, Conn.; M. C. Booze, Charles Taylor Sons Co., Cincinnati; L. A. Hewitt, Laclede-Christy Clay Products Co., St. Louis; C. E. Bales, Ironton Fire Brick Co., Ironton, O.; L. J. Trostel, General Refractories Co., Baltimore; J. L. Cummings, American Foundrymen's association, Chicago; and Messrs. Thompson and Allan.

Gives Talk on Bronze

Dr. R. C. Reader, Birmingham, England, recently gave a lecture before the Institute of British Foundrymen at the Engineers' Club in that city on "Aluminium Bronze." Dr. Reader has made a special study of this alloy and a short time ago paid a visit of investigation to America. The alloy has tensile strength of 60,000 to 70,000 pounds per square inch and the yield point from 22,000 to 24,000 pounds per square inch with elongation of 25 per cent. It withstands alternating stresses and is a suitable alloy for engineering purposes. It has a good resistance to corrosion by sea water and is suitable for ship fittings. The mechanical properties can be raised by the addition of 2 to 3 per cent iron 5 per cent nickel or 1 per cent manganese. It will then give a tensile strength of 80,000 pounds per square inch. Tin, silicon and phosphorus lower the properties, especially that of ductility. The best way of using the alloy to advantage is in die casting. Aluminium bronze has not the disadvantages of brasses which cover the metal mold surface with a layer of white zinc oxide which has to be brushed off. Brasses are liable to crack in the mold owing to their weakness at high temperatures. The alloy can be improved much by heat treatment. Dr. Reader mentioned that in America he found one of the large electrical companies using the alloy extensively for die casting.

Surface Combustion Co., designer and manufacturer of furnaces and equipment, has removed from New York to Toledo, O., where it has recently completed a new factory and office building at 1375 Dorr street. Charles A. Blesch, has been transferred from the Pittsburgh office to manager of the New York office.

New Sizes of Malleable Foundry Refractories

(1) Door Opening Tile.
5" x 9" x 24" and
5" x 13½" x 24"

(2) Tap-out Blocks
Outside dimensions 7½" x 7½" x 9" with suitable flare from the hole to the face to allow room for the tapping rod and plugging up. One block to have a ¾" diameter hole for foundries using hand ladles. One block to have a 1" diameter hole for furnaces served with bull ladles.

(3) Shapes for Side Walls, Bridge Walls, etc.

Classification	Sizes in Inches
9 inch straight	9 x 4½ x 2½
9 inch large straight	9 x 6¾ x 2½ (for breaking joints)
9 inch soap	9 x 2½ x 2¼
9 inch split	9 x 4½ x 1¼
No. 1 arch	9 x 4½ x (2½-2¼)
No. 2 arch	9 x 4½ x (2½-1¾)
No. 1 wedge	9 x 4½ x (2½-1⅞)
No. 2 wedge	9 x 4½ x (2½-1½)

(4) Shapes for Bungs

Classification	Sizes in Inches
No. 101 Square Bung	13½ x 4½ x 3
No. 102 Angle Bung	(13½-12⅛) x 4½ x 3
No. 103 Arch Bung	13½ x 4½ x (3-2⅝)
No. 104 Arch Angle Bung	(13½-12¼) x 4½ x (3-2⅝)
No. 105 Arch Bung	13½ x 4½ x (3-2⅞)

(5) Shapes for Stacks

Circle Brick	Sizes in Inches
24-inch circle	9 x 4½ x 2½
36-inch circle	9 x 4½ x 2½
48-inch circle	9 x 4½ x 2½
60-inch circle	9 x 4½ x 2½
72-inch circle	9 x 4½ x 2½
84-inch circle	9 x 4½ x 2½
No. 1 wedge	9 x 4½ x (2½-1⅞)
No. 2 wedge	9 x 4½ x (2½-1½)

Bill Gives a Recipe for a Clean Roll

By Pat Dwyer

DELICATE and romantic memories of other days, soft and wraith-like as the mists of the morning or the enchanted haze hanging over wooded hills in the langorous golden days of the falling leaves, flooded my mind at a recent concert where a chorus of beautiful young ladies in costumes of the nineties sang a number of old-time songs.

Boys and girls, fresh and blooming, full of fun rose to mind and in fancy I was back again in the old carefree days one of a merry party rolling home in the moonlight, seated on two long parallel planks on a bob sled and trolling forth all the songs we knew at the top of our lusty voices. Memories were tinged with a faint shade of regret as I contemplated the changes that have come with the relentless marching years. The party has been scattered as the late Mr. Longfellow remarked, like the leaves of the forest caught up by the whirling blasts of October and scattered afar o'er the ocean. Some are married, some traveled far away and made homes in alien lands among strangers and some, cut off in their innocent youth while life was still at the flood, rest peacefully and quietly under the sod.

The simple refrain of *Barbara Allen*, an old English ballad dating back to some time in the eighteenth century, kept running through my mind on the following day. Unconsciously at odd moments I found myself whistling a few bars. I never have drawn a prize as a whistler and I make no claim that I am as fine a whistler as ever cocked a lip, but I indulge in the sport in moderation and with proper discretion as to time and place and with due regard to the sensitive ear of the little pal who claims that half the notes are flat and the remainder are sour.

Just to see how the experiment would affect Bill I trolled a few lines of the song in his presence the other night:

In Scarlet town where I was born,
There was a fair maid dwellin'
Made every youth cry "Well-a-way,"
Her name was Barbara Allen.
All in the merry month of May,
When green buds they were swellin'
Young Jemmy Grove on his death bed lay,
For love of Barbara Allen.

"For the love of Pete," said Bill, "lay off that thing. In the first place you can't sing and in the second place the author who wrote the song should have been arrested and placed in a home for the feeble minded."

"Is zat so?" You know, the snappy retort. "Well, he or she would not have lacked company."

WEEPY DAYS IN SCARLETT TOWN

"That is not the point," Bill reminded me. "In the light of modern standards and conditions, dear children, let us examine this touching and sentimental little ballad and seek to discover wherein lies its appeal; why it causes the heart strings to vibrate and all that kind of bunk. In a word, let us take it apart and see what makes it tick.

"For no apparent reason the author sees fit to introduce himself first. Off hand I should characaterize that as a display of poor taste. Besides the statement adds nothing to the value of the piece. Who cares where he was born—or why? The statement is unnecessary. Obviously he was born, otherwise he could not have composed the monstrosity, but why bring that up? Also his reference to Scarlet town leaves too much to the imagination.

"Where is Scarlet town? Dash it all, does he expect the reader has the time to hunt all over the map for a little 2 x 4 town just because he happened to be born there? Really he is imposing too far on one's good nature. In fact the first line is entirely superfluous since at that point the author fades out of the picture after introducing the heroine in a few well chosen words 'There was a fair maid dwellin'.'

"We have to take his word for this. Perhaps she was fair, but that is a matter of opinion. According to the remainder of the text which we shall take up presently, there is room for reasonable doubt. The fact that she dwelt in the town is not a startling recommendation. She had to dwell some place and it might just as well be Scarlet town as elsewhere. Probably, although the author skips that item, she may have been born there. Presumably he was not the only person who could claim Scarlet town as a birthplace. The author would have made a greater hit with me if he had omitted all reference to himself and devoted the space to a few major specifications of the lady.

"For example he might have given the beam and draught and the length between perpendiculars. He might have described the figurehead, the cut

and hang of the sails with a hint whether she sailed better full and bye or close hauled on a quartering breeze.

"The next line—'Made every youth cry well-a-way'—is the limit! The English language contains approximately 500,000 words including several hundred terms of endearment and salutation. With this superabundance of material at hand, every young man she met greeted her with the pathetic wail 'Well-a-way.' She would have been less than human if she had not kept well away from that bunch. How she must have yearned for a real guy to come along. A lively young lad with a saucy grin, a dancing glint in his eye and a persuasive 'Hey! kid, will you step along with me?'

"'Her name was Barbara Allen.' A totally irrelevant touch. Shakespeare says a good name is to be chosen rather than great riches. Almost without exception, young ladies are willing to give up their names in favor of others. So far as I know the fact that the owner of the other name is afflicted with great riches never has been allowed to stand in the way. Pansy Periwinkle is a cute little name, but dear little Pansy would exchange it any minute for that of Mrs. T. Chas. Turnip, or Mrs. Alex S. Weasel.

"Look at the closing lines of the verse 'Young Jemmy Grove on his death bed lay for love of Barbara Allen.' There's a combination that ranks, nay outranks the rankest product of modern tin pan alley. It offends the eye, the ear, the rules of poetry, grammar and ordinary common sense. If Jemmy wanted to lay he should have selected a hen's nest. Think of rhyming Allen with swellin.' Oi! Oi! Boibra Ellin! If the truth were known brave Jemmy tanked up on home brew with a view of enlarging his vocabulary beyond the scanty 'Wella--way' and over estimated his capacity.

"In the second verse we learn that: 'Death is printed on his face and o'er his heart is stealin'. Then haste away to comfort him, O! lovely Barbara Allen.'

"Apparently Jemmy was in a bad way, but why should Barbara be asked to haste away to comfort him? No logic in that argument. Unless possibly the request meant that she was to haste away as soon, as fast and as far as possible in the opposite direction. The victim's lamentable condition was due to the proximity of a lady who required more than a vacant sigh and a silly well-a-way to attract her interest. A voluntary visit on her part where she might be tempted to hold his hand would be the signal for Jemmy's departure in spontaneous combustion.

"The fair maid seemed to realize all this. 'So slowly, slowly she came up and slowly she came nigh him. And all she said when she came there: Young man I think you're dyin'.'

"In other words she took her time. Probably attended a matinee first and then, the day being fine and having no

BARBARA HITS THE TIES FOR HOLLYWOOD

pressing engagements on hand, she strolled up the garden path to Jemmy's front door. A dainty little vision in sprigged muslin, with eyes modestly downcast under the shade of a poke bonnet, she floated into Jemmy's room, light as a puff of thistledown. With the scene all set for a grand demonstration, an opportunity of sending our hero off to the happy hunting grounds in a blaze of glory, what does Barbara say? I think I have mentioned elsewhere that Jemmy was not what you would characterize as a loquacious bird. Apparently Barbara also had her limitations. 'Young man' sez she 'I think you're dyin'.'

"In the third and—thank heaven—last verse the author gathers the scattered threads, makes an abortive attempt to point a moral and sums up the story in a manner that would draw tears—of derision—from the eyes of a potato or a graven image.

When he was dead and in his grave,
Her heart was struck with sorrow.
O mother, mother, make my bed,
For I shall die tomorrow.

"Now, isn't that a likely story? Why should her heart be struck with sorrow? She had no use for this wishy-washy, well-a-way, moon calf while he was lying in wait at unexpected places to gaze at her dumbly and bleat his pitiful refrain 'well-a-way.' Credulity cannot be stretched to the point of believing that she grieved when he was removed providentially from her path. If she was sorry for anything probably it was because he had not been drowned when he was a pup. If you ask my opinion, brave Jemmy never had all his marbles. With a countryside fairly overflowing with young and charming damsels full blythe to name the day if approached in a proper manner, he crept off to bed, shut his eyes, buried his nose in the pillow and auto-suggested himself out of existence for love of Barbara Allen. Bah! Twice. One for you and one for me.

"If any doubt remains regarding her lack of sorrow, it is effectually dispelled by the next two lines. 'O mother, mother, make my bed, for I shall die tomorrow.' This statement throws an interesting side light upon our heroine. Her time was so fully occupied in applying the war paint and feathers with which she reduced all available young men to a condition of stammering imbecility, that she never had learned to make her own bed. That was a job for the poor doting old mother.

"The author woefully fluffed his catch there. If he had the slightest conception of dramatic value, if he had looked up the works of any standard ballad maker, in a word, if he had not been what I strongly suspect, one of Jemmy's well-a-way pals, he would have done right by our Nell and put her away in a proper manner. One that would cause fat, salty tears to stream down the face of the old town clock for generations.

"Instead of putting on her frilliest night gown and oozing in between the lavender scented sheets of a nice freshly made bed, there to expire in peace and comfort, Barbara should have donned the mother's faithful old shawl and slipped out to the cemetery at midnight. The old sexton making his round in the morning following a wild and stormy November night of drenching rain, would find all that was mortal of the love stricken maiden huddled in a bunch of thistles over the approximate position of Jemmy's faithful heart. 'Twould make a swell pitcher, with the subtitle, 'All's well that ends well!'

"That would have been the logical way to finish the story. What does the author do? Listen:

'Farewell,' she said, 'Ye virgins all
And shun the fault I fell in.
Henceforth take warning by the fall
Of cruel Barbara Allen!'

"How does she get that way? What fall is she talking about? Certainly

she did not fall for Jemmy. If the truth were known, if the author had stuck to the actual facts in the case instead of trying to make a pitiful stab for sympathy he would have admitted that Barbara had a good night's sleep in her little crib and then had hooked it in the morning after leaving the following note where her mother would find it about 11 a. m. when she came to call her:

Farewell, old dump, I'm well away,
No more time for dilly-dallin'
Me for the bright lights night and day.
Pip, pip, Barbara Allen!

"Why, Bill, old boy," I cried admiringly ,"that verse matches the style of the others perfectly. If I had your gift I should enter the ranks of popular song writers."

"Any dumbell can write that kind of stuff," said Bill. "That is the reason it makes me tired. Besides I hate to write. I don't mind talking—"

"Do you know any more funny ones?"

FROM ALL APPEARANCE THE PARTY IS OVER

"What do you mean, funny ones?" Giving me the eye. "I say I don't mind talking a little now and again, but I detest the labor of setting words down on paper. Too slow. I had an interesting session the other day with a lad who was having some trouble with a cored roll. This was a press roll 20 inches diameter outside, 16¾ inches inside, 8 feet 8 inches long on the body with an 8-inch diameter neck, 10 inches long at each end.

"The core was 5 inches diameter in the neck and was held down by a 1-inch bolt extending from the top to a point a short distance below the bottom plate where it was secured with a nut. The casting was poured from iron with silicon 1.35 per cent, manganese 0.85 jer cent, phosphorus 0.37 per cent, sulphur 0.10 per cent, and combined carbon 0.61 per cent. The roll is designed to take a high polish and therefore the surface must be close grained and perfectly clean. In an effort to collect dirt that appeared at the top he had placed a riser 17 inches diameter, 12 inches deep on top of the neck, but this caused an objectionable open grain in the iron in the neck. One casting also had gas holes from top to bottom.

"I pointed out that dirt in the top of a casting may be due to the style of the gate and method of pouring the iron, but when this dirt also is associated with gas holes in the casting it is apparent that the dirt was generated inside the mold. He did not state whether the mold was made horizontally and then upended for pouring, or, molded on end in a set of round flasks. Also whether it was poured on the top or the bottom. All these factors exert a direct influence and while the mold may be made in either position, certain features will have to be observed in one that are not necessary in the mold made the other way. For example the style of pattern and shape of the flask.

"Speaking offhand and basing my opinion merely on general experience I said the core probably was responsible for all the trouble. The iron does not lie against it quietly, but bubbles and boils and as a result, the casting is filled with dirt and blowholes. Quite possibly the boiling action ceases before the iron shows in the riser. Therefore no evidence of the boiling action is apparent. Instead of speculating on the course of action probably followed I outlined briefly a satisfactory method.

"Exceptionally open sand should be used for the mold and core and both should be dried almost to the burning point. If a suitable barrel is available the core may be swept up in coarse loam. If the core is made in dry sand, the interior is filled with coke so that a shell of sand 2 or 3 inches thick is all that remains. A generous opening at least 2 inches diameter should be provided through the neck cores top and bottom so that the vent may escape with the greatest ease. The core is made from a good grade of coarse sharp sand bonded with any of the recognized core binders. Sand with a natural clay bond should not be used. The binder should be used sparingly so that the spaces between the grains of sand are left as open as possible. Also to facilitate the removal of the core from the casting. After the two halves of the core are wired and pasted the entire core is placed in the oven to dry the paste and blacking.

"The best place to pour the roll is on the top through a ring of small pop gates spaced about 6 inches apart on the rim. The upper neck may be drawn upward about 6 inches and flared out somewhat to serve as a feeder. Small sectional chills rammed up with the sand inside and outside the junction of the neck and the body will prevent any tendency toward segregation or open grain in that area. The iron analysis given is satisfactory. A short bolt hooked to the core arbor will hold the core down as satisfactorily as a bolt extending all the way through the core. In one prominent foundry a long bolt extending through the core is employed, but it is the only reinforcement in the core. It is provided with small flanges spaced a few feet apart and attached with small cast iron pins designed to break after the casting is poured to allow the central bolt to expand. As previously stated several constructional features are optional. The only real important point is to have a core and mold perfectly dry and made from material that will not cause the iron to boil?

"Meeting's adjourned," I said. "Did you ever play Puss in the Corner?"

"Once," said Bill. 'Only once, when I was a kid. I got hit in the puss and laid in the corner all night."

Began Course

A course in steel foundry work recently has been started by the Milwaukee Vocational school. The course is intended for foremen and superintendents and the classes are held one night a week for 20 weeks. James C. Sweitzer, in charge of melting and research work, Sivyer Steel Castings Co., Milwaukee, is conducting the course. Operation, maintenance, and technical problems will be discussed.

Richard Devens, for 20 years New York manager, Brown Hoisting Machinery Co., Cleveland, has joined the Link-Belt Co., Chicago, as sales engineer for its crane products in eastern territory. His headquarters will be at the firm's New York office, 233 Broadway.

Recalls Apprentice Days

Foundry Apprentices in the Sixties Received an All Around Training in Every Phase of Operation Connected with the Industry

By Robert E. Masters

VARIOUS articles on foundry apprenticeship, especially one by Paul R. Ramp *Apprentice Training Makes Molders* in a recent issue of THE FOUNDRY interested me very much, took me back through many years of foundry practice and brought up thoughts of apprentices then and now.

Many foundries in the old times took apprentices for three or four years and let them rock along, to pick up and absorb all they were capable of from seeing and doing. Many of these boys profited by this system of training to the fullest extent and became highly competent molders, capable of doing first class work on anything on the floor. At that point they stopped. They had gone as far as their opportunities allowed them to go.

They had no knowledge of cupola practice or of many other features essential to a foundry foreman before he can take charge of a shop and run it satisfactorily. Often I have been surprised in the past and present at the number of men in the foundry industry who really know nothing of what constitutes foundry practice except the little required of them on the floor as molders. Furthermore they are satisfied to let it go at that.

On the other hand consider the list of pseudo wise men who deliver scientific lectures or write on foundry practice in a manner that would stagger and confuse the most practical expert. They never in their lives mixed a batch of facing or set the strikes for a loam mold. Notwithstanding a gift of gab on the subject they know absolutely nothing about doing any of the work in a practical way. There you have both sides of it.

Plenty of Opportunity

Old times in the present instance means 50 or 60 years ago. Many foundries in that day gave their apprentices every opportunity and instruction they were capable of grasping. They turned out workmen qualified to handle any branch of the foundry business.

In October 1866 my uncle, Hyatt Frost, manager of Van Ambergh's circus and menagerie with which I had been traveling for 8 years took me to an old friend of his, George Quintard a leading member of the firm Secor & Co., owners of the Morgan Iron Works, New York city. As a result of the visit I became an indentured apprentice to the foundry trade for three years under a $200 bond. Many apprentices in worth while shops all over the country in that day, went through the same experience.

For the first three months I worked around the cupola, learning to chip it out, daub it, put in the bottom and the breast, tap out and stop up, help daub and dry ladles, make up charges and charge the cupola. In fact I had to learn everything about working a cupola, even to running the cinder mills and saving the scrap. Any boy 18 years of age and not an absolute moron could not fail to take in the most important points and profit by three months steady application to this branch of foundry work.

Several Changes

The second three-month period was put in on the floor learning to temper and cut the sand, making facing mixtures and putting up and pouring off simple castings in green sand. Then followed three months in the core room, mixing the core sand, making and drying all kinds of molds and cores. Final three months of the first year were spent on higher classes of green sand work with some ventures in dry sand. During my first year I was paid $3 per week.

First three months of the second year were spent in the pattern shop, learning the whys and wherefores of this foundry department. By the same token patternmaking apprentices had to spend three months in the foundry learning the other side. This method of mutually exchanging ideas promoted harmony between patternmakers and molders. Each had a better understanding of the problems confronting the other.

About this time John Roach, owner and manager of the Etna Iron Works, reached out and acquired control of several ironworking plants in the New York district. He bought out Mr. Quintard of the Morgan Iron Works and stationed his son Stephen there. He also bought the Neptune, the Franklin Forge Co. and others long before he started on his shipbuilding career in Chester, Pa. It is claimed that the first compound steam engines built in the United States were built in Roach's shops.

John Roach was a remarkable man. He was born and spent his boyhood in Ireland. After he learned that the middle initial in my name stood for Emmet and that my birthday coincided with his and fell on Christmas day, I was teacher's pet.

Remainder of my apprenticeship term, a year and nine months was put in on general jobbing work in green sand, dry sand and loam until I could handle anything offered in the shop before I was 20 years old. Many of the loam molds in pits and on the floor were made entirely from sketches and drawings.

During the closing six-month period I had to take charge of the foundry for 30 days. I had to give out and direct the work, count up the weight and take off the heats. Any new casting on which the weight was not known, and some of them were quite large, had to be measured. I had to calculate the amount of iron required to pour them and pick out the proper ladle or ladles. This practical application of geometry would make some apprentices *figger and figger* on account of the varied and complicated shapes of the molds and cores.

When my term of service expired Oct. 1, 1869 I was not yet of voting age. I received the $200 bond money, $100 bonus and a new suit of clothes from the company and for a brief period I felt like one of the bloated bond holders at that time appearing in illustrations with dollar bills peeping out of every pocket.

Hear Talk on Costs

The Quad-City Foundrymen's association held its regular monthly meeting at the Armstrong hotel, Rock Island, Ill., on Nov. 21. T. F. Wharton, secretary and comptroller, Deere & Co., Moline, Ill., spoke on "Foundry Costs".

Predicts New Era

In Gray Iron Foundry Practice

[*Foundry Engineers, Speaking at Thirty-First Annual Convention of National Founders Association Announces Changes—Costs Considered*]

By B. K. Price

Associate Editor, THE FOUNDRY

GRAY iron foundries are facing a new era of advancement, is the emphatic belief of E. A. Custer, Jr., Philadelphia, who addressed the members of the National Founder's association at the thirty-first annual convention of that society held in New York, Nov. 16 and 17. Mr. Custer, whose interesting articles in THE FOUNDRY for Oct. 15 and Nov. 1, have aroused wide interest and comment, spoke at the close of the afternoon session, Nov. 16.

The speaker outlined various promising developments in foundry practice in recent years and pointed to strides being made abroad, particularly in Germany, with its pearlitic iron; in Italy, where synthetic sand is used extensively; and in France, where cleaning processes have been developed to a high stage.

He looks for progress to follow in this country along similar lines. Mr. Custer cited several cases where synthetic sand is being used almost exclusively, and at no great additional cost. The permanent mold, or the long life mold, has great possibilities, and already is proving its worth in many plants. He regards the permanent mold as in no sense a cure-all, and admits that it can never be adapted in a number of castings. Nevertheless there are a great many that can be made in permanent molds. The use of this mold requires study at the start, and where it can be used, should result in considerable saving.

Mr. Custer, discussing the gray iron foundry of the future, traced the development of the industry. He stated that the industry as now known began with the development of the cupola in France in 1722. He said that the growth in this country was rapid until the early fifties of the last century, when steel began coming into greater use, and that from that time on until almost the present had under gone a state of inertia.

Indicating that gray iron has many potentialities yet undeveloped fully, he referred to his experiments in 1910 with tempering gray iron. He said that he was able to make it harder than any steel on the market, although it was too brittle for commercial application. The next year, he said, he developed gray iron with far greater magnetic qualities than steel, and in 1923, a process of heat treating. However, this latter process was retarded in its application and further study by the development of pearlitic iron in Germany.

C. S. KOCH
—elected vice president

Mr. Custer commented at some length on this German iron. He said that the Germans sold manufacturing rights in England, France, Denmark and even Brazil, but that they had difficulty establishing the process in this country. The speaker intimated that a German company would be established in the United States possibly next year for the production of this iron. He said that it is important for domestic gray iron foundries to develop a process that will compete. In England, the speaker declared, 17 foundries are operating at a high rate, producing the pearlitic iron. They are getting a high price for the iron and are producing it at little above the cost of producing regular gray iron castings.

Foundrymen, Mr. Custer said, should be sure to study their temperatures carefully. He believes that investigation along this line will prove of considerable assistance in enhancing the quality of their iron. He believes also that the blowing of sand into the molds affords an interesting problem.

Discussing methods of cleaning, he referred to a hydraulic process, which will be brought out shortly after the first of next year. Water, he said, will be used under pressure and carrying an abrasive grit. He declared that the experiments he has seen have been highly successful. Even in cases where the sand had been burnt on deeply, the cleaning had been thorough. He said gray iron castings cleaned by this process should be below black heat.

Discussion during the two days of the convention embodied many such general subjects, as industrial training, political relations, costs, and employment questions. Opinion that the industry has experienced a slowing was confirmed in remarks of various trade leaders.

Of special interest was an address by E. T. Runge, Cleveland, who pointed out that of the 200,000 manufacturing companies throughout the country 80 per cent operated at a loss; 10 per cent with a profit of more than $5,000 and 10 per cent with a profit of less.

He mentioned seven reasons why foundries operate at a loss. One, he said, was the quoting of castings on a freight allowed to customer's plant basis instead of on a basis of f.o.b. cars. Another reason was to be found in the cash discount allowed

customers, which the speaker said amounts to an allowance of a dividend to the customer of 24 per cent per annum. The third reason lies in the castings returned to the customer and not allowed for in the compilation of costs.

Another was the impracticable figure used in estimating molding and labor. For instance, Mr. Runge found that many foundries figure their molding costs on a 9-hour day, when their actual time for molding is about 7½ hours. Assuming that cost figured on the 9-hour basis was 80 cents, he said that it would be obvious that the real cost, figured on the 7½-hour basis, was $1, or a difference of 20 cents. This, he said, extended to the overhead, might amount to 200 per cent or another 40 cents, making for a total in all of 60 cents. If the casting is a 60-pound casting this would amount to a matter of 1 cent per pound aside from all other items of cost.

Mr. Runge said that 90 per cent of the foundries either figure costs on the average price per pound or have no cost system at all, and that therefore it is necessary to divide foundries for cost accounting purposes into at least four departments, namely melting, molding, cleaning and core-making. A cored casting leads to extra molding and labor cost and among other things, a decrease in the tonnage which must bear a fixed expense.

The practice of selling castings below cost to increase tonnage and thus bear overhead expenses has proved to be impracticable. He said he felt safe in saying that there never was a casting sold below cost that helped the foundry or any other plant.

S. W. Utley, president of the American Foundrymen's association, when called upon by President Barr of the National Founders, presented the compliments of the A.F.A. and in a brief but comprehensive manner outlined the aims and purposes of the two organizations. He said, broadly speaking, the objectives of the National Founders association had to do with personnel, the human relations of the industry, while the American Foundrymen's association, in its program of research, its conventions exhibitions and committee activities handles those problems that are connected with the materials used in foundries and the equipment by which work is accomplished.

L. W. Olson, Ohio Brass Co., Mansfield, O., chairman of the committee on industrial education reported on the progress of the apprentice training plan in various localities. In many centers, the work is going forward with the co-operation and assistance of public school organizations. L. A. Hartley, director of the industrial education activities of the N.F.A. supplemented these data in an address Thursday morning. Thirty industrial centers now have an enrollment of 577 apprentices.

C. S. Koch, president, Fort Pitt Steel Casting Co., McKeesport, Pa. was elected vice president, succeeding W. A. Griswold, Gray & Dudley Co., Nashville, Tenn. William H. Barr, Buffalo, was re-elected president; A. E. McClintock, commissioner; and J. M. Taylor, Chicago, secretary.

Readers Comment

Note—Material appearing under this head does not necessarily reflect the opinion of THE FOUNDRY or of its editors.

TO THE EDITORS:

Frequently I read inquiries about non-shrinkable white metal for patterns. Usually the mixture recommended is tin, 50 per cent and zinc, 50 per cent. This is a good metal, but as most patterns are soldered in some way or other, particularly when runner gates are added in brass or composition metal, pattern makers object to the mixture given.

For the past ten years I have used a formula which has given satisfaction and which meets the objections stated to the other type of white metal. The mixture I use is as follows: Tin, 32 per cent; lead, 64 per cent; antimony, 8 per cent. At current metal prices this mixture is about $9 cheaper than the tin-zinc combination. It runs sharp and molds can be rammed fairly hard to bring out details on the pattern.

The metal should be poured at deep red color. It should not be gated direct and it will run the thinnest castings.

AUGUST M. ROTH,
Richmond Hill, N. Y.

Who Pays for Customer's Pattern Loss?

Question: In the case of damage to customers' patterns by fire or other cause, is a jobbing foundry responsible for repairs or replacements?

Answer: This is a moot question and one which has been variously interpreted. The subject has been considered in the standard trade customs adopted by various foundry organizations. The *Uniform Trade Customs* of the Ohio State Foundrymen's association states the question as follows: "Foundry not responsible for loss of or damage to patterns by fire or other casualties beyond its control. Patterns not in use for a period of six months shall be subject to storage charges."

One large and successful jobbing foundry in the West states: "We have lots of customers, and just as soon as a customer's patterns begin to need something, when they have more than six or eight patterns in our possession, we go to them and explain that the standard method is for them to carry fire insurance on their patterns. We provide a fireproof vault for the storage of their patterns when not on order, but when patterns are active, they may be in our pattern shop, in the foundry, in any department of our plant, and they may also be in transit between ourselves and our customer if they have had them returned for some reason. We also call his attention to the fact that sometimes he changes his sources of supply on castings; or he may have two or three sources where the patterns are interchanged all the time; the practice is to carry insurance.

Equipment Orders Decline

A RECENT report of the Foundry Equipment Manufacturers association, Cleveland, gives an index of gross orders for September of 80.4, *as compared with* 106.4 *in August. The index of gross orders since January,* 1921, *is shown in the following tabulation. The index figures represents the business done expressed as a percentage of an arbitrary base, which is the average monthly shipments for* 1922-23-24.

	1921	1922	1923	1924	1925	1926	1927
January	30.9	44.5	157.3	141.8	104.2	168.2	180.4
February	34.5	37.0	143.6	121.0	108.8	154.9	198.0
March	39.3	94.0	160.8	121.9	159.3	157.3	131.1
April	31.0	93.0	151.9	136.8	124.3	113.2	130.0
May	41.9	124.4	174.6	108.4	113.3	128.5	134.8
June	25.7	131.5	141.8	96.4	110.5	133.5	138.4
July	50.5	87.6	118.4	62.8	117.0	127.3	89.9
August	22.7	114.1	119.0	77.5	190.0	141.2	106.4
September	38.7	72.8	78.0	66.0	94.2	114.0	80.4
October	42.5	107.3	115.1	85.5	149.5	140.5	.....
November	37.1	98.8	91.5	91.0	180.3	133.4	.....
December	33.4	112.0	138.4	137.8	140.1	181.0	.....

Milestones in Foundry Progress

As Recorded in the December Issue of THE FOUNDRY, Thirty, Twenty and Ten Years Ago

1897

WESTINGHOUSE Air-brake Co., Wilmerding, Pa., was the subject of the leading article in THE FOUNDRY of December, 1897. The article marks an epoch in foundry operation, for it describes what was probably the first practical application of continuous conveyors. S. D. Sleeth, who had succeeded his father, James M. Sleeth as foreman of this foundry which in 1897 had completed 27 years of useful service, was in charge at the time the continuous system was installed. The mold conveyor moved forward intermittently, 30 feet at a time, carrying the molds from the molding station to the place where cores were set, then to the pouring station in front of the cupolas and finally to the shakeout and repeating the cycle. A reciprocating sand-conveying system was another innovation in this forerunner of the modern production shop.

* * *

S. D. Sleeth still is an active figure in Pittsburgh foundry affairs and recently was an honored guest at a veterans' meeting of the Westinghouse organization.

* * *

A subscriber took issue with the Editor for his reluctance to admit arguments on the single tax into his columns. The Editor announced the policy that THE FOUNDRY was devoted to technical and business questions relating to the industry to the exclusion of all other matter.

* * *

Always something to argue about. Thirty years ago it was single tax and sixteen to one. Today it's worrying about having enough to pay even a single tax and the chances are sixteen to one that the foundrymen don't have it.

* * *

The Otis Steel Co., Cleveland, cast a steel gun, 32 feet long and weighing 60,000 pounds. The bore is given as 8 inches.

* * *

Discussion was rampant on a new method of cupola melting which required the injection of live steam through the tuyeres. Claims that the hydrogen produced reduced all oxides of iron, and that the moisture assisted combustion, leading to savings in fuel, hotter iron, etc., were warmly disputed.

Faked Foundry Facts

A Slip Jacket

Our friend Putnam said—"pure iron is the desideratum." If Brother Putnam will procure some wrought iron, he will have one of the purest forms of iron, but if he will attempt to make castings therefrom, he will find that pure iron is not such a desideratum as he would have us believe.

KRANK'S KORNER

1907

THE plant of the United States Cast Iron Pipe & Foundry Co., Scottsdale, Pa., then the largest unit of its kind in the world, was described in the lead article of the December, 1907, issue of THE FOUNDRY.

* * *

Revolving pit tables to carry the flasks, were provided. Four of these tables had a capacity of 94 double flasks each.

* * *

Five papers presented at the annual convention of the American Society of Mechanical Engineers, covering cupola practice, blower practice, metal mixtures, specifications for iron and fuel, and mechanical treatment of sand and a typical foundry for bench work were presented in abstract form.

Would not an occasional paper before the engineering societies on foundry operations and foundry products, particularly the latter, be in order in this latter day of 1927?

* * *

State factory regulations governing health and sanitation in foundries were approved editorially.

* * *

Foundry operations were ranging from 25 to 60 per cent of capacity. No suggestion of overexpansion of plant facilities is given among the various reasons assigned for the depression.

* * *

Toronto, Ont., Canada, was designated as the convention city for the A. F. A. in 1908.

* * *

The Bonney-Floyd Co., Columbus, had occupied its new plant.

* * *

Industrial Works, Bay City, Mich., was constructing a new gray iron and steel foundry to provide castings for its works.

1917

AGREED prices for castings based upon the base prices for various raw materials as established by the government as a war measure was the subject of a meeting of all classes of steel castings producers held in New York, Nov. 16, 1917, and reported in the December issue of THE FOUNDRY. Pig iron was fixed at $33 base, furnace, for No. 2, regardless of the producing point. Various grades of scrap were priced arbitrarily, in many cases being pegged above the existing market prices. The possible abrogation of existing contract prices was the subject of worry at that date.

* * *

A malleable foundry was organized and equipped ready for service at Richmond, Ind., in a total of 90 days, constituting a new record.

* * *

The National Founders' association at its annual meeting called attention to the fact that the available labor supply for foundries had declined 25 per cent since the start of the war. Emphasis was placed on expansion of mechanical facilities.

The Shakeout

DAN M. AVEY, Editor

PAT DWYER, Engineering Editor
FRANK G. STEINEBACH, Associate Editor

CHARLES VICKERS, Nonferrous Editor
EDWIN BREMER, Associate Editor

¶ Tools for the Tiller

AMERICAN farmers probably will attempt again to secure the passage of farm relief measures during the coming session of Congress. An effort will be made by that great body of workers which produces the food supply of the country to secure legislation designed to give them a larger share in the prosperity of the nation. Unless the proponents of the relief bills introduce measures radically different in principle from the McNary-Haugen measure, which met defeat in the past session of Congress, it seems probable that no such legislation will be effected. Practically everybody agrees that something should be done for the farmer, but few are in accord upon the methods of providing such relief.

IN A RECENT issue of *Collier's* the opinion is expressed that it is not within the power of this congress or any of its successors to give the farmer the support desired. That publication believes that the farmer suffers because he pits his physical strength against the productive power of machines, which in industry are used to such great advantage. Exception is made to the many that employ modern tools and manage their farms skillfully, but by and large, farm work of today differs but little from the toilsome tilling of generations ago.

PERHAPS this crticism should be tempered, since much progress has been made in certain sections of the country in producing crops. A large amount of planting, cultivating, and harvesting machinery now is in use. In numerous instances small farms are being consolidated to secure greater operating economies. Where the farmer tilling a small acreage is forced to use antiquated methods and machinery, the larger units, resulting from the combination, have sufficient capital to purchase the necessary equipment to perform the bulk of the work mechanically. However, leaders agree that farmers generally must adopt modern methods to increase profits, and with modern methods will come an increase in the use of machinery. This offers growing opportunities to manufacturers of that type of equipment.

¶ Shows Mechanical Trend

MANUFACTURE of cast iron pipe is a growing industry according to a recent report published by the bureau of census. During the past 11 years or from 1914 to 1925 the number of establishments engaged in the manufacture of pipe has increased from 59 to 77. For the same period the average number of wage earners employed has increased from 12,557 to 23,033 or 83.4 per cent. Wages paid to the workers during 1914 amounted to $7,075,976 or about $563 per worker. In 1925 the amount paid to the wage earners was $27,438,033. This appears to be an extraordinary increase, but it must be remembered also that the number of wage earners employed practically was doubled during the intervening period. However, even when the total wage is allocated among the workers, the amount per worker is about $1191. Compared to $563 paid in 1914, the 1925 wage is an increase of 111.5 per cent.

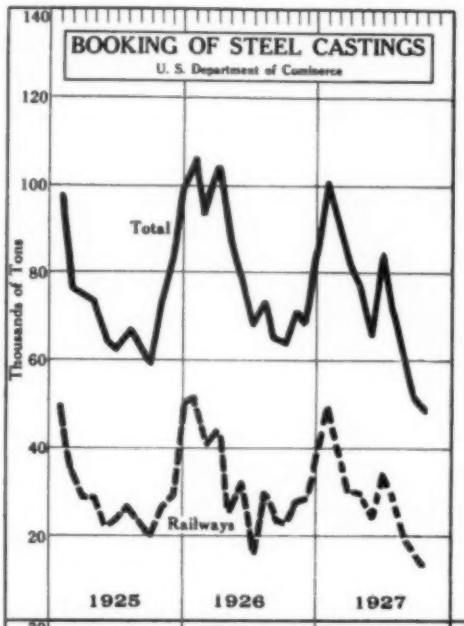
ONE of the most striking illustrations of the increased use of mechanical equipment is presented in the bureau's report. During 1914, the value added by manufacture was $9,729,244 or about $774 per worker. In 1925 the value added had risen considerably and amounted to $51,541,293 or about $2237 per worker. A comparison of the two values added per worker shows that for 1925 over 1914 the increase was 189 per cent. Another theory held by some that machinery reduces the number of workers, is refuted strongly when the number of wage earners in 1914 and 1925 compared show an increase as mentioned, of 83.4 per cent. A further evidence of growth in mechanical aids is presented in the figures for horsepower employed. In 1914 the amount used was 25,864 horsepower while in 1925 it had risen to 54,820 horsepower or an increase of 112 per cent.

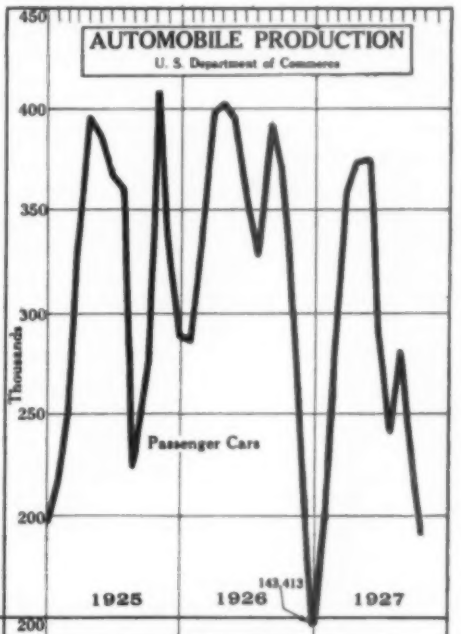
Trade Trends in Tabloid

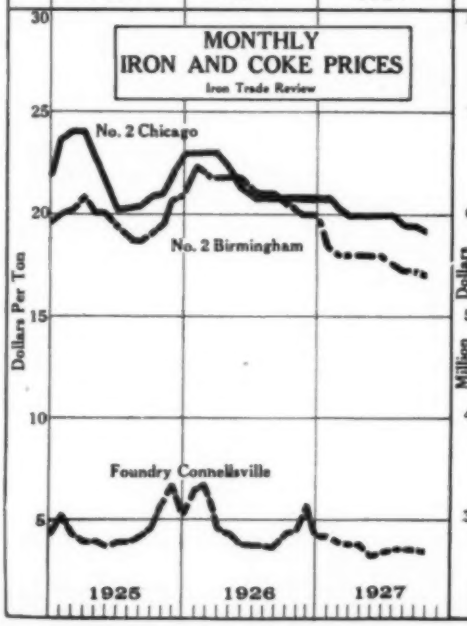
CONFIDENCE is expressed throughout the foundry industry that the low point in castings demand has been approached and that soon after the first of the year an advance will be noted. In general, eastern jobbing foundries are doing more business than are those of the Middle West and South. Prices, too, are better in the East. Production in many lines has dropped below normal consumption and with the prevalence of hand-to-mouth buying and the absence of stocks of materials, demand is piling up in many quarters. Coupled with this factor is the easy credit situation which invites increased activity and improved conditions in rural communities due to ample crops and improved prices. Agricultural implement sales during 1927 have been the highest in ten years and the outlook for 1928 is good. Automobile production is declining with the close of the year, but improvement confidently is expected with the advent of the new year. Railway car orders still are at a low point and even with the increased tonnages hauled and greater efficiency in operation, large replacement orders are lacking. Building contracts for October set a new high level with prospects for continued activity. Slight stiffening is noted in cast-iron pipe prices. Nonferrous operations are slow in line with the general business situation throughout the country.

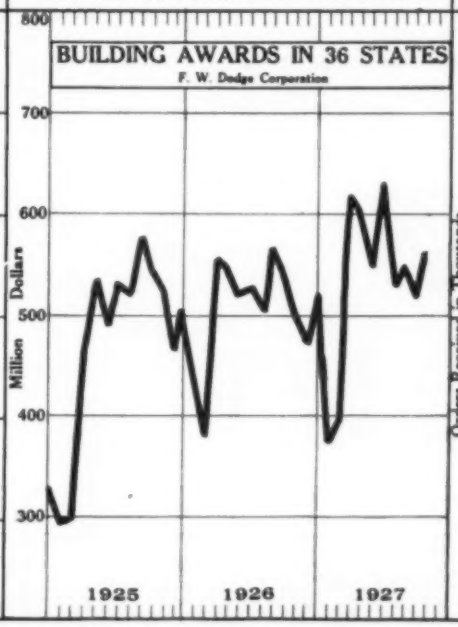
RAW MATERIAL PRICES
Nov. 22, 1927

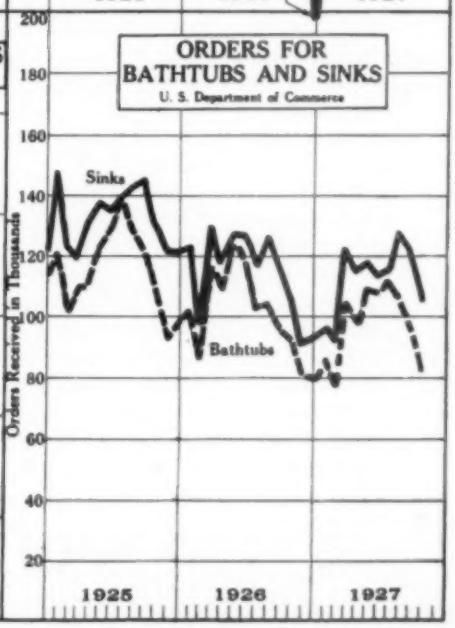
Iron	
No. 2 foundry, Valley	$17.50
No. 2 southern, Birmingham	16.00
No. 2 foundry, Chicago	18.50
No. 2 foundry, Philadelphia	19.76 to 20.76
No. 2 foundry, Buffalo	17.00
Basic, Valley	17.00
Basic, Buffalo	17.00
Malleable, Chicago	18.50
Malleable, Buffalo	18.50
Coke	
Connellsville foundry coke	$3.75 to 4.25
Wise county foundry coke	4.00 to 5.00
Scrap	
Heavy melting steel, Valley	$14.50 to 14.75
Heavy melting steel, Pitts	14.00 to 14.50
Heavy melting steel, Chicago	11.50 to 12.00
Stove plate, Chicago	12.00 to 12.50
No. 1 cast, New York	13.50 to 14.00
No. 1 cast, Chicago	14.00 to 14.50
No. 1 cast, Philadelphia	16.50 to 17.00
No. 1 cast, Pittsburgh	14.50 to 15.00
No. 1 cast, Birmingham	14.00 to 14.50
No. 1 cast, Buffalo	11.50 to 12.00
Car wheels, iron, Pittsburgh	14.00 to 14.50
Car wheels, iron, Chicago	13.00 to 13.50
Railroad malleable, Chicago	12.50 to 13.00
Agricultural Mal., Chicago	11.75 to 12.25
Malleable, Buffalo	14.25 to 14.75
Railroad malleable, Pitts	14.50
Nonferrous Metals	Cents per pound
Casting copper, refinery	13.37½ to 13.50
Electro copper, producers	13.75
Straits tin	58.25
Lead, New York	6.25
Antimony, New York	10.75
Nickel, electro	39.00
Aluminum, No. 12, producers	23.50
Aluminum, No. 12, remelt	17.00 to 18.00
Zinc, East St. Louis, Ill.	5.80 to 5.85











Personal

Robert Gray has been made general superintendent of the Worthington Pump & Machinery Corp., Worthington works, Harrison, N. J.

William A. Waskey, general manager, Malleable Iron Works, New Britain, Conn., has resigned to become associated with the International Harvester Co., Hamilton, Ont.

J. H. McPhail and W. A. Maher have been appointed sales manager and assistant sales manager, respectively, of the Ternstedt Mfg. Co., Detroit, subsidiary of the General Motors Corp.

William M. Krauser, formerly with the safety department, Ford Motor Co., Detroit, has been made head of the safety department of the Wilson Foundry & Machine Co., Pontiac, Mich.

E. Clay Howell, formerly secretary and general manager, Kalamazoo Malleable Iron Co., Kalamazoo, Mich., has been appointed vice president and general manager of the Peerless Malleable Castings Co., Toledo, O.

R. F. Harrington, metallurgist, Hunt-Spiller Mfg. Corp., Boston, was the principal speaker at the November meeting of the Boston chapter of the American Society for Steel Treating, held Nov. 4 at the Massachusetts Institute of Technology.

H. W. How, formerly chief engineer, Buffalo Foundry & Machine Co., Buffalo, has been made consulting engineer of the Struther-Wells Co., Warren, Pa. Before the war Mr. How was in charge of the machine and plate shop of the Thomas C. Basehor Co., and later with the Southern Menhaden Co., Jacksonville, Fla. He had been with the Buffalo Foundry company for the past five years.

Melting and Annealing Discussed at Pittsburgh

Two papers were read before the Pittsburgh Foundrymen's association meeting held Nov. 21, in the Fort Pitt hotel, illustrated by lantern slides. The first, by F. W. Brooke, chief engineer, William Swindell & Bros., Pittsburgh, was entitled "Recent Developments in Melting Equipment for Castings with Special Reference to the Electric Furnace", and the second by George P. Mills, electric engineer of the same company, on "Annealing and Heat-Treating Castings by the Use of the Electric Furnace". The heat treatment of alloy and steel castings was fully described as was the latest installations of equipment for this purpose. After the dinner, Herbert T. Herr Jr., J. S. McCormick Co., presented motion pictures of the organization's picnic held in June. It was announced that the annual Christmas dinner will be held in the English room of the Fort Pitt hotel, Monday evening Dec. 19.

Buffalo Foundrymen Meet

The regular monthly meeting of the Buffalo Foundrymen's club was held in the club rooms at 140 Chandler street on Nov. 16. Robert T. Turner, sales manager, Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., spoke on the bucket system of cupola charging and illustrated his talk with motion pictures and lantern slides.

To Hear Addresses

The Ohio section of the American Institute of Mining and Metallurgical Engineers will hold a meeting at the Allerton hotel, Cleveland, on Dec. 2. E. DeGolyer, president, and Dr. H. Foster Bain, secretary of the institute will address the meeting. Mr. DeGolyer will speak on locating ore bodies by geophysical means and Dr. Bain will discuss political conditions in the Orient in their relation to development of mineral industries. After the dinner a short business session and election of officers will be held.

Believes Organization Movement Sound

NO GRAY iron foundryman can study the address* of E. A. Custer Jr., delivered last week at the convention of the National Founders' association, without realizing that his industry is possessed of numerous latent possibilities for development. His word picture of the future castings establishment with improved products marketable in broader consuming fields is especially alluring at this time when so much is said and written of the present limited demand for castings and the apparent encroachment of competitive materials.

Mr. Custer's address is opportune in that it emphasizes the importance of the survey being conducted by the department of commerce to obtain fundamental statistics of the gray iron industry. These and other recent activities on behalf of the producers of gray iron castings reflect a growing determination to get to the bottom of the problems of the industry. They point more and more directly to the need of an organized movement to establish a "gray iron" consciousness among logical customers.

In this day of keen competition between industries, products and methods, executives are rapidly awakening to the fact that their major business problems are external rather than internal. For the moment production, labor, and other matters within the organization are secondary to marketing, rivalry of competitive products and methods and other problems originating outside the company. No foundryman working independently can effectively combat these external attacks on his business. It is clearly a job for a co-operative body, and the sooner the gray iron foundrymen organize for research and market development, the better will be the prospect for stability and growth of the industry. But organization alone will not cure present foundry ills. Urgent as gray iron foundrymen need a co-operative agency to combat their external problems, it would be a mistake to set up a research and marketing organization unless the members are determined to give it wholehearted and adequate financial and moral support. After all, the fate of the industry lies in the hands of the individual foundrymen.

Opportunity is knocking at the door of the gray iron industry. Have the individual foundrymen the vision and courage to launch an organization and the determination to see it through?—*Iron Trade Review, Nov.* 24, 1927.

*Containing points developed in his article "An Engineer Visualizes the Foundry of the Future," THE FOUNDRY, Oct. 15, Nov. 1, 1927.

A. G. Henricks Is Dead

Arthur G. Henricks, vice president, Harnischfeger Corp., Milwaukee, died in that city on Nov. 9. He was born in Milwaukee on April 16, 1879 and was educated in the district schools and local colleges of that city. Mr. Henricks became associated with the firm in 1901 and advanced through the various departments of the company to the position of vice president and general manager. He possessed a creative ingenuity and had many patents to his credit. He is survived by his widow, Mrs. Hattie Henricks.

Obituary

Charles F. Pfister, a director and member of the executive committee, Allis-Chalmers Mfg. Co., West Allis, Wis., died Nov. 12. He was born in Milwaukee 68 years ago and was a member of the boards of directors of a large number of corporations and banks.

R. Spurrier Howard-Smith, for many years treasurer of the Link-Belt Co., Chicago, died Oct. 29 at the age of 67 years. He was graduated from Columbia university, New York, and the University of Tennessee, Knoxville, Tenn., and joined the Link-Belt Engineering Co. in 1883. Mr. Smith was vice president and treasurer of that company until 1905 when he was made treasurer of the Link-Belt Co.

Charles F. Attwood, president, Attwood Brass Works, Grand Rapids, Mich., died recently at his home in that city at the age of 70 years. He had been identified with many industrial activities in Grand Rapids since 1893. Mr. Attwood was born in London, England, and moved to Ottawa, Ont., when a small boy. Later he went to Chicago where he apprenticed himself to Crane & Co., beginning his career in the brass department. He also was at one time a foreman with Weir & Craig Co. and with Harris & Bros., Chicago. Mr. Attwood opened a brass foundry with F. J. Harring but the company dissolved and in 1905, he and his son founded the Attwood Brass Works which later was changed to a corporation.

Vincent J. Hughes, president, Canada Iron Foundries Ltd., Montreal, Que., died in that city on Nov. 10 at the age of 53 years. He was born in Toronto and in 1894, he was graduated from the University of Toronto. After practicing as a lawyer for some time in that city, he went to Montreal as manager for the Montreal Trust Co. In 1914 Mr. Hughes enlisted with the Canadian forces returning with the rank of major. He then became associated with the Canada Foundries Ltd., gradually rising to the position of president.

Carleton A. Chase, Syracuse, N. Y., for many years prominently identified with the metal working industry, died

ARTHUR G. HENRICKS

in Philadelphia, Nov. 16, aged 63 years. Mr. Chase was the son of the founder of the Syracuse Chilled Plow Co., now under the John Deere Co. He joined the company shortly after leaving school, becoming vice president in 1902 and president some years later. On Jan. 31, 1920, Mr. Chase resigned this position to become president of the First Trust & Deposit Co., Syracuse. He also was president of the Bank of East Syracuse and of the Eastwood bank Syracuse, and was interested in many other commercial enterprises. He was vice president of the Rochester & Syracuse railroad and the Empire State railroad. Mr. Chase was active in the National Association of Manufacturers and the National Founders' association, serving at one time as vice president in both organizations, and for a number of years was a member of the National Industrial Conference board. He was affiliated with many industrial and social organizations.

Fred B. Chappell, manager, Glens Falls Machine Works, Glens Falls, N. Y., died recently.

Alonzo G. Kinyon, consulting engineer, Fuller-Lehigh Co., Allentown, Pa., died on Nov. 13 following an operation. He was born in Amboy, Ill., in 1870 and early became associated with railway work. While he was connected with railways, he was identified with development of fuel burning equipment and fuel conservation. In 1915 Mr. Kinyon turned his attention to pulverized fuel and later organized the Kinyon Pulverized Fuel Engineering Co. He became associated with the Fuller company in 1918 and developed a conveying system for transportation of pulverized material. In recognition of his efforts he was awarded the Longstreth medal and given life membership by the Franklin institute. Beside his affiliation with Franklin institute he was a member of the Traveling Engineers, International Railway Fuel association and the American Society of Mechanical Engineers.

Officers Are Elected

Officers of the newly consolidated Industrial Brown Hoist Corp., Cleveland, which was formed by the merger of the Brown Hoisting Machinery Co., and the Industrial Works, Bay City, Mich., were elected as follow: A. C. Brown, president; Melvin Pattison and H. H. Perry, vice presidents; E. S. Clark, general secretary; A. J. Copeland, treasurer; G. L. Harman, sales manager. District sales managers are: New York, James Shearer; Philadelphia, W. L. Brown; Pittsburgh, H. C. Knight; Detroit, B. W. Beyer; Cleveland, H. E. Hayes; Chicago, C. H. White; New Orleans, W. T. Simpson; San Francisco, H. D. Wright; Bay City, Mich., Benjamin Dixon.

Hold Joint Meeting

The Newark Foundrymen's association and the materials handling division of the American Society of Mechanical Engineers held a joint meeting at the Downtown club, Newark, N. J., on Nov. 30. E. H. Ballard, general foundry and pattern shop superintendent, General Electric Co., Lynn, Mass., spoke on "The Need for Closer Relationship between Designing Engineer, Pattern Shop, Foundry and Machine Shop." R. T. Turner, sales manager, Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., gave an illustrated lecture on "Mechanical Handling in Foundries."

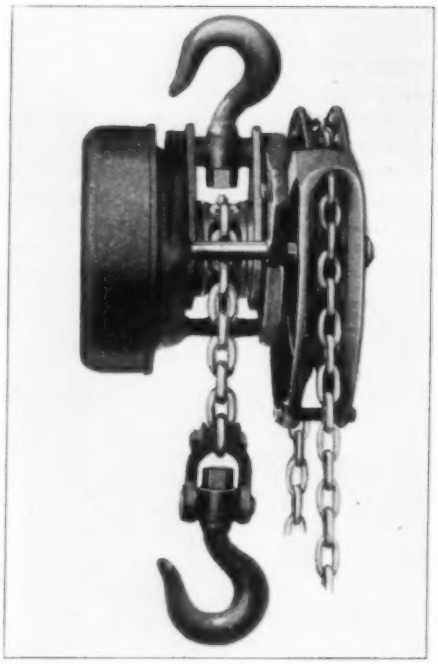
Timken Roller Bearing Co., Canton, O., and M. B. U. Dewar, have purchased all of the capital stock of the British Timken Ltd., from Vickers Ltd. The company will be under the active management of Mr. Dewar and the Birmingham, England, plant will be enlarged and new machinery and equipment will be installed.

Compactness Features Chain Hoist

The Dickerman Hoist Mfg. Co., 872 East Seventy-second street, Cleveland, recently has introduced a new chain hoist which has a number of interesting features. The hoist is equipped with ball bearings of the self-contained type. Felt washers protect the bearings from dirt, grit and other abrasive materials, and retain the lubricating oil. A view of the hoist is shown in the accompany illustration.

An endless hand chain, sometimes called an operating chain, passes over a hand wheel which turns the screw hub of a ratchet friction disk keyed to a one piece drive shaft and pinion. The pinion meshes with two gears held diametrically opposite in a pinion cage, which is secured by double keys to the load wheel carrying the load chain. Integral with these gears are intermediate pinions that mesh with a large internal gear and serve as a fulcrum to rotate the planetary gear.

A pull on either side of the hand chain loop causes the drive pinion to rotate the gears in the opposite directions, thus causing the pinions to travel around the internal gear, revolving the pinion cage and load wheel, thereby raising and lowering the load. Capacities over 10 tons are made with two gear trains contained in separate gear cases connected by a yoke, and operated by separate hand chains but having a single hoisting hook.



FELT WASHERS PROTECT THE BEARINGS FROM DIRT

E. P. Meixsell, formerly assistant sales manager at the Easton, Pa. plant of the Pennsylvania Pump & Compressor Co., has been appointed manager of its New York office at 136 Liberty street, New York.

Omitted Credit Line

Through an oversight one of the illustrations used in "Metal for Malleable Iron Fittings Melted in the Cupola", by L. E. Gilmore which appeared in the Nov. 1 issue of THE FOUNDRY was not credited. Fig. 2 on page 841 should be credited to "Non-technical Chats on Iron and Steel", by L. W. Spring.

Sells Equipment

The Stoney Foundry Engineering & Equipment Co., Cleveland, has sold a shakeout bail to the Lakey Foundry & Machine Co., Muskegon, Mich., and vibrator and shakeout equipment to Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., Humphrys Mfg. Co., Mansfield, O., Weil-McLain Co., Michigan City, Ind., Henry Furnace & Foundry Co., Medina, O., Cleveland Co-Operative Stove Co., Cleveland, Southern Wheel Co., Toledo, Standard Sanitary Mfg. Co., Louisville, International Heater Co., Utica, N. Y., Clark Equipment Co., Buchanan, Mich.

Thomas Arthur, away from his desk at Hickman, Williams & Co., Pittsburgh, for the past ten months or so, has resumed his executive duties as vice president and director, having fully regained his health.

Foundry Association Directory

American Foundrymen's Association

President, S. W. UTLEY, Detroit Steel Casting Co., Detroit; secretary-treasurer, C. E. HOYT, 140 South Dearborn street, Chicago; technical secretary, R. E. KENNEDY, 909 W. California street, Urbana, Ill.

The Buffalo Foundrymen
Buffalo

President, J. MCARTHUR, Washington Iron Works; secretary, W. J. WARK, E. J. Woodison Co., 146 Chandler street. Meetings on third Wednesday of the month at 146 Chandler street.

Chicago Foundrymen's Club
Chicago

President, G. H. ROLLINSON, American Brake Shoe & Foundry Co.; secretary, ALBERT N. WALLIN, S. Obermayer Co., 2563 W. Eighteenth street. Meetings second Saturday in each month at the City club, 315 Plymouth court.

Connecticut Foundrymen's Association

President, FRED W. STICKLE, Capitol Foundry Co., Hartford, Conn.; secretary, C. S. NEUMANN, Union Mfg. Co., New Britain, Conn. Meetings are on second Friday of each month in various parts of the state.

Detroit Foundrymen's Association
Detroit

President, J. J. BOLAND, Griffin Wheel Co., Detroit; secretary, ROBERT HOPE, Holley Carburetor Co., Detroit. Meetings third Thursday in each month at the Union League club, 35 Grand River avenue, Detroit.

East Bay Foundrymen's Association
Oakland, Calif.

Secretary, H. L. MARTIN, Marchant's Foundry Co., 4401 East Tenth street, Oakland, Calif.

Metropolitan Brass Founders' Association
New York

President, WILLIAM EMBER, Jefferson Brass Foundry, 62 Delevan street, Brooklyn, N. Y.; secretary WILLIAM E. PAULSON, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meeting second Wednesday in each month at the Building Trades club, 34 West Thirty-third street, New York.

Newark Foundrymen's Association
Newark, N. J.

President, J. L. CARTER, Barlow Foundry Inc., Newark; secretary, W. H. MANTZ, Atlas Foundry Co., Irvington, N. J. Meeting called by president.

New England Foundrymen's Association

President, HENRY S. CHAFFEE, Builders Iron Foundry, Providence, R. I.; secretary, FRED F. STOCKWELL, 205 Broadway, Cambridgeport, Mass. Meetings second Wednesday of each month at the Exchange club, Boston. Outings usually are held in the summer months.

Ohio State Foundrymen's Association

President, C. C. SMITH, Toledo Steel Casting Co., Bancroft and Smoad avenue, Toledo, O.; secretary-manager, ARTHUR J. TUSCANY, 5713 Euclid avenue, Cleveland.

Philadelphia Foundrymen's Association
Philadelphia

President, WALTER WOOD, R. D. Wood & Co., Philadelphia; secretary HOWARD EVANS, Union League club, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Southern Metal Trades Association
Atlanta, Ga.

President, GEORGE B. COCKER, Gastonia, N. C.; secretary, W. E. DUNN JR., Healy building, Atlanta, Ga.

Pittsburgh Foundrymen's Association
Pittsburgh

President, C. D. CAREY, American Steel Foundries, Pittsburgh; secretary-treasurer, WILLIAM J. BRANT, Wm. J. Brant, Bessemer building, Pittsburgh. Meeting on the third Monday of the month, except in July and August, at Fort Pitt hotel.

Quad-City Foundrymen's Association
Davenport, Iowa

President, HYMAN BORNSTEIN, Deere & Co., Moline, Ill.; secretary-treasurer, H. A. DEANE, Deere & Co., Moline, Ill. Meetings the third Monday of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

Tri-City Technical Council
Moline, Ill.

Chairman F. V. SKELLEY, Tri-City Railway Co., Rock Island, Ill.; treasurer, MAX SKLOVSKY, Deere & Co., Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association
Cincinnati

President, HAROLD P. RITTER, John A. Oberhelman Foundry Co., 3323 Colerain avenue; secretary, GEORGE W. PIEHL, Wessling Bros. Foundry Co., 1607 McLean avenue. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association
Minneapolis-St. Paul

President, H. H. NOTT, Smith System Heating Co., Minneapolis; secretary-treasurer, C. E. LANGDON, 3849 Lyndale avenue, south, Minneapolis. Meetings monthly at the Athletic club.

Washington Foundrymen's Club
Seattle

President, RONALD KUCHER, Olympic Foundry Co., Argo Station, Seattle; secretary, EDWARD C. GUSTIN, The Prescott Co., 1 West Lander street, Seattle. Meetings second and fourth Tuesdays of each month at the Elks' Temple, Fourth avenue and Spring street.

Jolt-Squeeze Copes for Auto Cylinders

Designed specifically to meet the requirements of a large automobile manufacturing interest in the Middle West, the molding machine shown in the accompanying illustration was built by the Tabor Mfg. Co., Philadelphia, and presents many interesting features. With three operators and air pressure at any point above 65 pounds it is claimed this cope machine will keep pace with a rollover jolt machine made by the same company on which drags are turned out at the rate of 60 per hour.

The machine is self-contained on a substantial base casting in which is embodied a 10-inch jarring machine complete with jarring mechanism, pattern drawing piston, jarring head, support for pattern plate, adjustable mold lifting posts and other features. The machine is of the so-called shockless type in which it is claimed no vibration is transmitted to the floor, machinery or molds in the vicinity. The machine squeezes the sand in the cope after it has been jolted. All operations are controlled from a centrally located valve stand, with the single exception of locking and unlocking the squeezing head. This head is mounted on roller bearings and swings easily. A hook on the lower end of a bolt suspended from the yoke engages the anchor stop bolted to the base. An interlocking device prevents application of the pressure against the squeezing head when the hook is not anchored.

TEETH MAY BE REPLACED WITHOUT REMOVING THE CHAIN

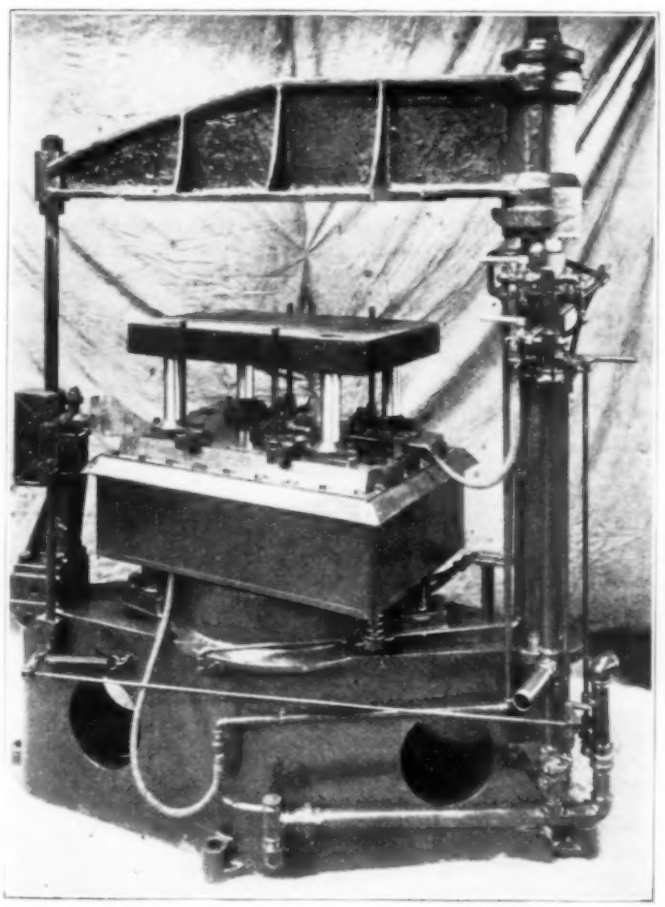
The machine is designed to lift the mold from the pattern.

Piston-anvil, jarring head and entire pattern drawing mechanism are supported on a nest of compression springs which it is claimed absorb all the vibration incident to operation of the jarring mechanism. A leather buffer washer on the piston-anvil prevents metal to metal contact in the jarring operation. It is claimed this device prevents any rebound of the flasks. Four lifting posts on the stool plate are adjusted to engage four points on the lower edges of the cope flask and support it while the plate and pattern drop away.

The upper end of the jarring piston is bored out to receive the 7½-inch draw piston. This draw piston is hollow and forms a reservoir for oil. A slow start valve in this reservoir automatically regulates the speed of the pattern draw, also provides a quick return. It is stated that the oil control eliminates any tendency to jump in drawing the pattern.

Has Removable Teeth

The Union Chain & Mfg. Co., Sandusky, O., recently has introduced a sprocket for chain drives which has removable teeth. The design of this sprocket is shown in the accompanying illustration. The body is cast steel. The teeth are made of a strong, wear resisting alloy steel to give long service. The sprockets are made for large chains having a pitch usually greater than 3 inches. The bolts expand the circular ends of the teeth and make the teeth practically an integral part of the body. The teeth can be inserted in a few minutes without removing the chain. These sprockets are supplied either split or solid.

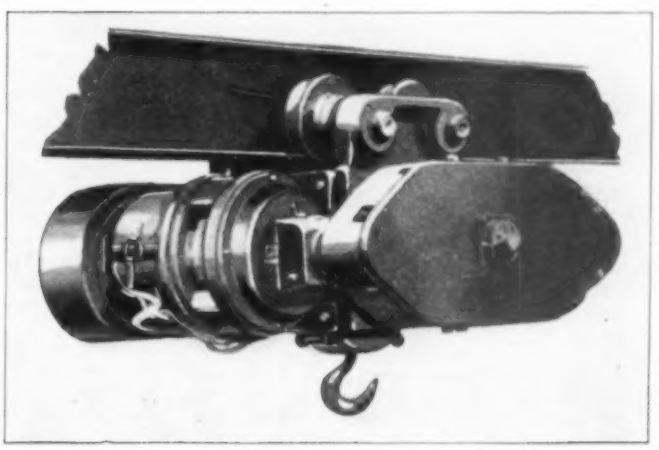


Left—All Operating Mechanism is Supported on a Nest of Compression Springs in the Base. Below—The Hoist Is Designed for Plants Having a Low Ceiling

Has High Hook Lift

The Northern Engineering Works, Detroit, recently has added a new series of hoists to its line of cranes and hoists.

The new hoist is of compact design, and rigid construction. Besides ready accessibility and high efficiency in operation it features an exceptionally high hook lift, for use especially in plants having low ceilings. A view of the hoist is shown in the accompanying illustration.



What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

General Bronze Co., Pittsburgh, recently was organized by C. S. Rush, E. J. Averman and R. R. Wood with general offices and works at 3212 Smallman street. The firm will specialize in the production of phosphor copper, copper, bronze, and babbitt metals for mills, machinery builders, shipbuilders and railroads.

Lehigh Foundries Inc., Easton, Pa., Alexander A. Shumann, treasurer, Morrisville, Pa., has purchased the Easton plant of the Kuebler Foundries Inc., bankrupt. This plant was bought at a receivers sale recently by the Gibney Iron & Steel Co., Phillipsburg, N. J. The plant will be enlarged and equipment will be increased. Iron castings will be added to its products.

B. & B. Foundry Co., 1540 West Thirty-fifth street, Chicago, has been formed to manufacture nonferrous castings. The company plans to incorporate soon.

Midwest Brass Foundry, Chicago, has removed from 552 West Lake street to its new plant at 228 North Washentaw avenue. Its production of nonferrous castings will be continued with larger facilities.

C. A. Lindstrom, 5702 Wentworth avenue, Chicago, manufacturer of wood and metal patterns and models, has added a line of permanent molds for nonferrous castings.

Shepard Elevator Co., Cincinnati, has purchased the business and plant of the John J. Brice Foundry Co., an adjoining property. Operations of the foundry will be continued under the same management.

Empire Steel Casting Co., Frush Valley, Pa., has been reorganized and will enlarge operations. Charles S. Payson is chairman and Frank Hodson, president and director of the firm.

Advance Pattern & Foundry Co., 2734 West Thirty-sixth place, Chicago, will build a 1 and 2-story foundry 125 x 365 feet at Thirty-sixth place and California avenue. A. A. Wickland & Co., 5 South Wabash avenue, are engineers. (Noted Oct. 1)

Crescent Stove Works, Evansville, Ind., pattern building was damaged by a recent fire. George Buente is president of the stove works.

Appleton Mfg. Co., Batavia, Ill., maker of agricultural implements, contemplates building new plants and installing equipment.

Parsons Co., Newton, Iowa, maker of dragline excavators and kindred machinery plans to build a 1-story addition.

F. G. Volpe, Hager street, Arlington, Mass., has awarded the contract for a 1-story machine shop and foundry, 50 x 100 feet.

Aetna Iron Works, New York, has been incorporated with $20,000 capital to manufacture iron and steel by D. O. Kuh, 36 West Forty-fourth street, attorney.

United Shoe Machinery Co., Beverly Mass., plans to build a 4-story addition, 60 x 200 feet.

Hanson Clutch Machinery Co., Tiffin, O., has awarded the general contract for a 1-story addition 50 x 150 feet to Fred Baumgardner, Tiffin.

Herschell Mfg. Co., 648 Washington street, East Peoria, Ill., contemplates building a 1-story foundry.

Hughes Tool Co., Houston, Tex., H. R. Hughes, 300 Hughes street, president, has awarded the contract for an addition 140 x 300 feet to the machine shop, to the Houston Ready-Cut House Co., Polk street. The addition will provide more space for the company to manufacture its line of oil well drilling tools.

Hill Pump Valve Co., 4600 Schubert avenue, Chicago, has been incorporated with $16,000 preferred stock, 900 shares no par value stock to manufacture pump valves, bearing metal, etc., with S. G. Levy, 38 South Dearborn street, correspondent.

Kewanee Boiler Co., Kewanee, Ill., E. E. Baker, president, contemplates building a plant addition.

Caterpillar Tractor Co., East Peoria, Ill., B. C. Heacock, manager, has awarded the general contract for a 1-story plant to the Austin Co., 510 North Dearborn street, Chicago.

Lexington Foundries, New York, has been incorporated with $1000 capital to do metal working by C. Marks, 302 Broadway, attorney.

Kings County Castings Co., Brooklyn, N. Y. has been incorporated with 1750 shares no par value stock to operate a foundry by Cook, Nathan & Lehman, Trinity building, New York, attorneys.

Essex Foundry Co., Murray street and avenue D., Newark, N. J., has awarded the general contract for a 1-story addition to the Austin Co.

Barstow Stove Co., Providence, R. I., will abandon its foundry and devote the space to assembling gas ranges. J. P. Barstow is president.

W. A. Griswold Co., Nashville, Tenn., has been incorporated with $100,000 capital to manufacture stoves and ranges by W. A. Griswold, 3403 West End avenue. It has obtained a building which it will remodel and equip with machinery.

Eastern Malleable Iron Co., Naugatuck, Conn., has taken over the plant of the Malleable Iron Works, New Britain, Conn., and will use it for a branch works.

Gaffers & Sattler, Los Angeles, stove and heater manufacturing company, has awarded the contract for a foundry and machine shop to William P. Neil Co. Inc. The company is also installing a sheet metal press.

Pittsburgh Water Heater Co., Pittsburgh, has completed its foundry at Idlewood, near Carnegie, almost doubling the floor space previously had in the plant.

Tunkhannock Foundry Co., Tunkhannock, Pa., has been established under the management of Frank Little and Harold Cosper, to have a modern foundry and machine shop. The company is located in the building formerly occupied by the Belmont Hardware Co.

An iron foundry for East Prospect, Pa. is being planned by Belson Loucks and Harry Wallick.

Woodard Engineering Co., Wooster, O., manufacturer of heavy and specially designed machines, will build a 1-story plant 100 x 300 feet, on East Pontiac street, Fort Wayne, Ind.

Weil-McClain Radiator Works, Erie, Pa., has work under way on its new plant, and expects to go into complete operation by April 1, next year.

New Trade Publications

DIESEL ENGINES—A bulletin by the Chicago Pneumatic Tool Co. covers in full detail its solid injection diesel engine in 80 to 240 horsepower. Illustrations show the engine and its parts. Diagrams and tabular data cover the engineering aspects.

ROSIN, TURPENTINE, ETC.—The Hercules Powder Co., Wilmington, Del., has published a catalog describing its naval stores which includes rosin, turpentine, pine oils and other terpene derivatives. Its nitrocellulose, pyroxlin paste and acids also are described.

ELECTRIC EQUIPMENT—Among current bulletins by the General Electric Co., Schenectady, N. Y., are the following: Squirrel cage motors; drum type controller equipment; control equipments; hand-starting compensators; automatic starting compensators; shoe-type solenoid brakes.

OXYGEN MANIFOLDS—Air Reduction Sales Co., New York, has issued a section of its standard catalog devoted to manifolds for controlling discharge of oxygen from a number of cylinders. By use of these devices oxygen is distributed by pipe line at proper pressure to a number of cutters and welders. It is illustrated to show method of connecting cylinders and regulating pressure.

ELECTRIC HOISTS—A catalog has been issued by the American Engineering Co., Philadelphia, covering its various devices and including six new sizes recently added to its line. This carries the range to 24,000 pounds capacity. The catalog covers four distinct classes, each with four to six sizes, with various types of suspension and control. It is fully illustrated by halftones and diagrams.

PULVERIZERS—Bethlehem Steel Corp., Bethlehem, Pa., recently has issued a catalog describing its roller grinding pulverizer for pulverizing fuels and other materials. Details of operation and construction are presented, and numerous illustrations show the component parts of the machines.

ELECTRIC MELTING POTS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued a leaflet describing its automatic electric melting pot. It covers the application for which these pots are suitable and gives data and advantages obtained from their use. They are used for melting soft metals and low-temperature drawing baths in heat treatment of steel tools and parts.

DIESEL ENGINES—Worthington Pump & Machinery Corp., New York, has published a 27-page catalog describing its double-acting, two-cycle diesel engines. The catalog is illustrated well with numerous diagrams and reproductions of photographs showing the action cycle and the construction of the engines. Data on the performance of the engines also are presented.